

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

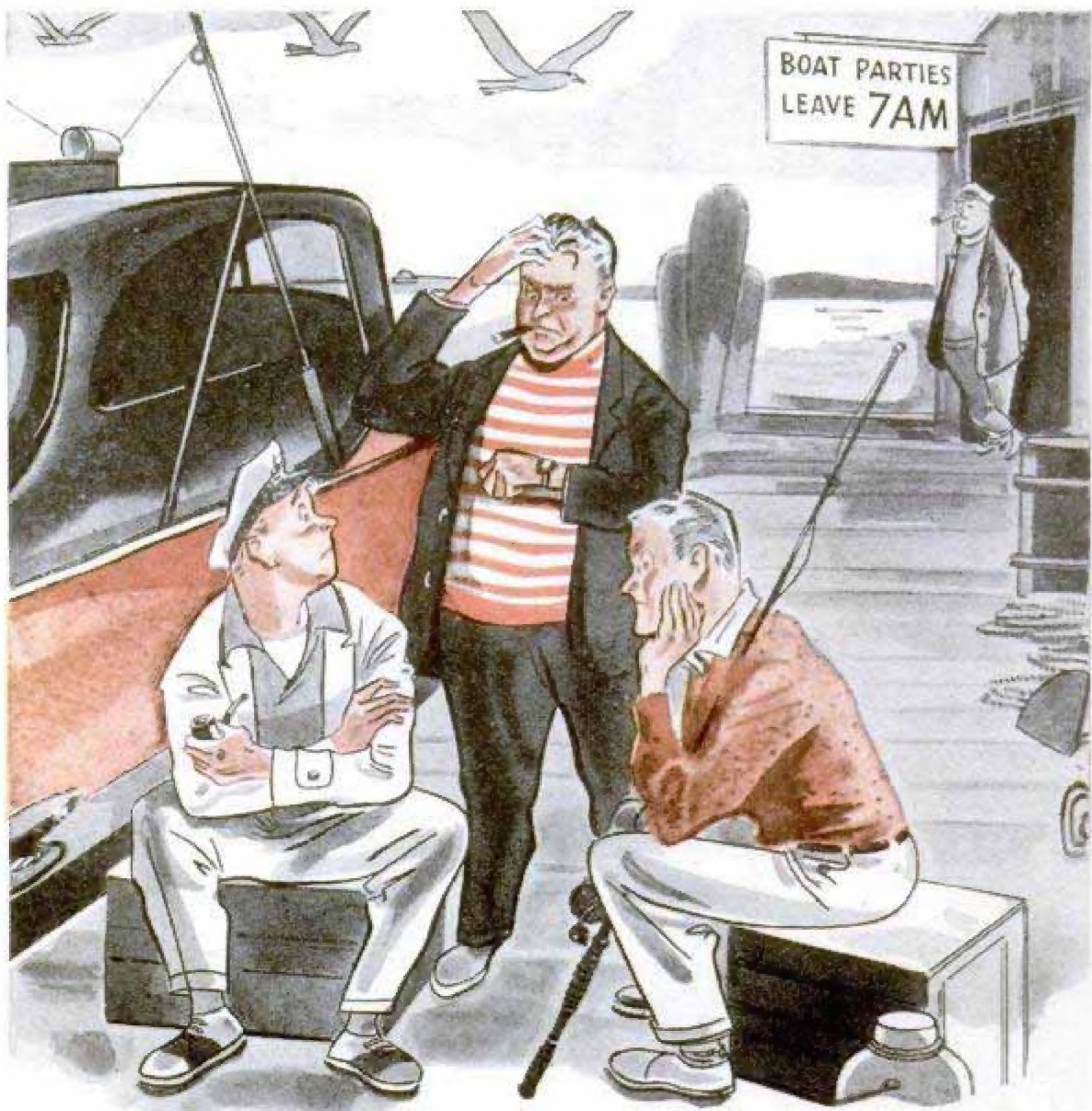
REG'D. TM. E. MARK. U.S. PAT. OFF.

REG. U.S. PAT. OFF.



POCKET SOS
Page 102

YOU WON'T GET ANYWHERE UNLESS YOU START



WHEN IT'S AN *Exide* ...YOU START

To delay your friends . . . on fishing, hunting or other trips . . . is an offense that few things can excuse. Least of all the complaint "I couldn't start my car" . . . for such failures need not happen.

To arrive on time, start on time. When you buy a battery for your car, buy *starting assurance*. **REMEMBER**, a single starting failure can be far more costly than the little extra you pay for a trustworthy, long-lasting Exide Battery.



1888... DEPENDABLE BATTERIES FOR 61 YEARS... 1949

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THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
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A Straight Steer About the NEW FORD "FEEL"



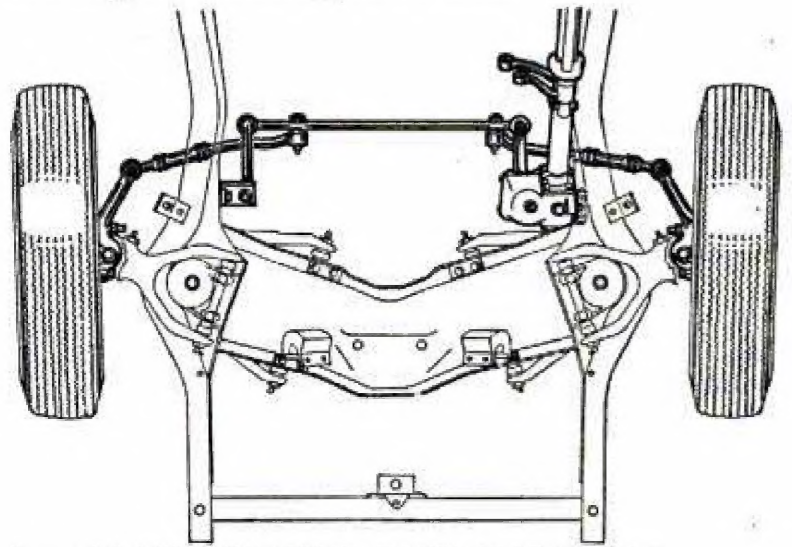
Take the wheel...

... of the '49 Ford and you'll sense in a minute that here's a new "feel" in driving. That's because, for one thing, the '49 Ford has practically effortless "Finger-Tip" Steering—a new, symmetrical steering linkage combined with new independent front wheel suspension and extra-large worm and roller type steering gear. Either wheel is free to move up and down without affecting steering. Pitman and idler arms are of equal length and parallel. Tie-rods and lower control arms move through similar arcs to preserve steering accuracy at all times.

And the precision-built steering gear uses a large triple-tooth roller, mounted on two sets of needle bearings, to eliminate sliding friction.

Steering ratio is increased nearly 10% for even easier steering control.

Yet Ford's "Finger-Tip" Steering is only one of the many advancements that combine to produce the new Ford "Feel"—the "Feel" that drivers acclaim as being revolutionary in the field.



Symmetrical steering linkage permits up and down wheel movement without affecting steering accuracy.

In flashing performance... solid roadability... and reassuring security, too, the '49 Ford has literally brought a new "feel" to driving. Now—today—take the wheel and try the new Ford "Feel."



White sidewall tires, optional at extra cost

There's a ^{NEW} Ford in your future

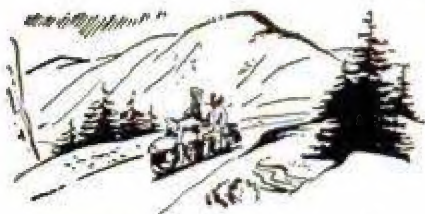
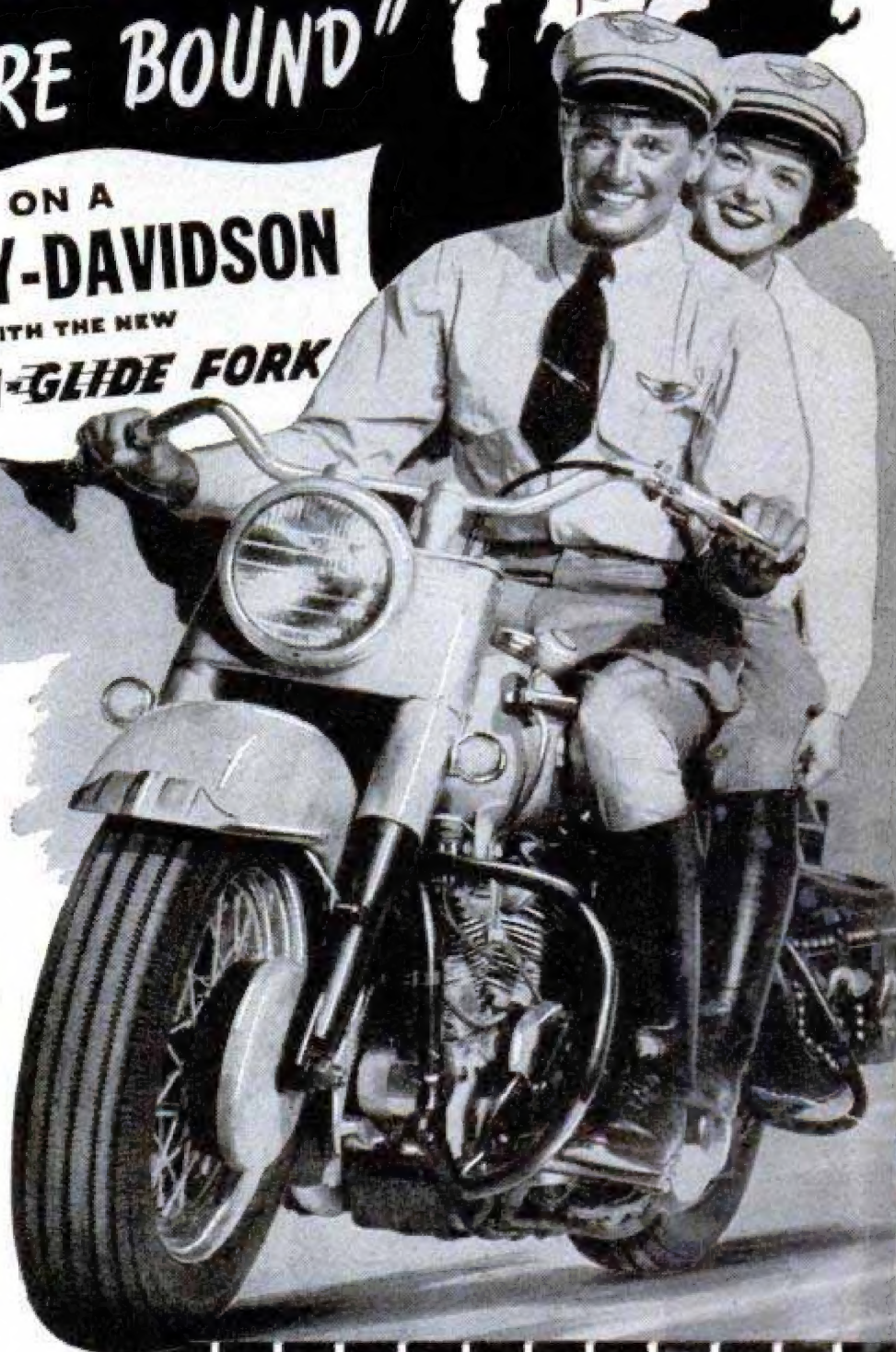
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This One



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HYDRA-GLIDE FORK



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H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

PUT THE PILOT in a mighty rough situation, we instructed Bob Barker, the artist who drew the cover. Up he came with a painting that fills the bill. Barker crashed the poor pilot in desert country with miles and miles of nothing around him and, we imagine, some injured crewmen. A mighty bleak situation. But wait! Our hero pulls from his pocket a remarkably compact little instrument, straps part of it to his head, pushes up an antenna and starts turning a small crank. Although he can't hear a thing, the air waves are filled with a distress hum that can be picked up by planes flying at 2000 feet as far as 50 miles away. The personal SOS is designed to be carried in the pocket of every member of the crew to supplement the wartime Gibson Girl, a 40-pound job that is too bulky and heavy for anything but large aircraft. For more complete details of this pocket lifesaver developed by the U. S. Air Force, flip over to page 102

Published monthly by Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill. H. H. Windsor, Jr., president; William Harrison Petridge, vice president; D. F. Windsor, vice president and secretary-treasurer; Clover L. Perkins, advertising manager; Alan M. Deyoe, circulation manager. Single copy in the United States and Canada, 35 cents; subscription rates in United States and possessions, Canada, Philippines and countries of the Pan-American Postal Union, 1 year, \$3.50; 2 years, \$6.00; 3 years \$8.00. To all other countries add \$1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 30 days in advance so you will not miss an issue. Give both old and new addresses. Entered as Second Class Matter, September 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at Post Office Dept., Canada. Copyright 1949 by Popular Mechanics Company. Copyright under International Copyright Union. Copyright in France. All rights reserved under Pan-American Copyright Union. Printed in the United States of America.

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Number 2

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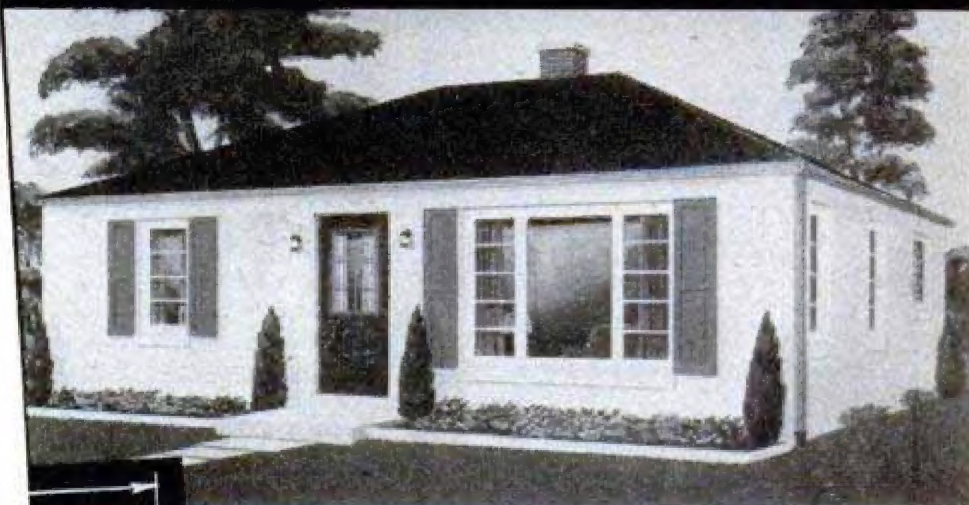
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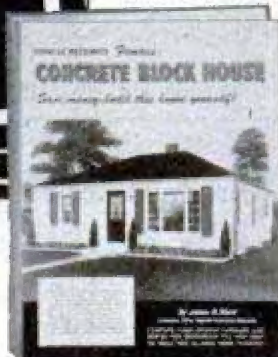
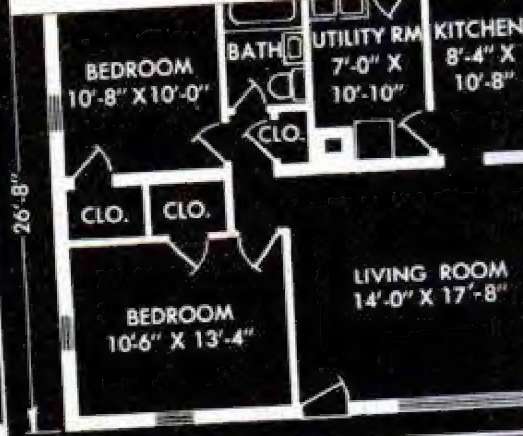
Build-It-Yourself Book and Set of Building Plans, Only \$12.50



Beat the High Cost of Home Owning! No Experience Needed! Follow Book and Plans! Save Thousands of Dollars!

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Popular Mechanics Build-It-Yourself Concrete Block House is 26'-8" deep by 32'-8" wide. It has 675 square feet of comfortable living space—living room, two bed rooms, cabinet kitchen, utility room, bath and three closets. Built in a Chicago suburb, a relatively high price region, in a high price year, its total cost was less than \$3650.00 including all material, heating, plumbing and electrical equipment and outside labor for installing the equipment and plastering all rooms. In many localities it can be built for even less and additional savings can be made by using less expensive bath and kitchen equipment.

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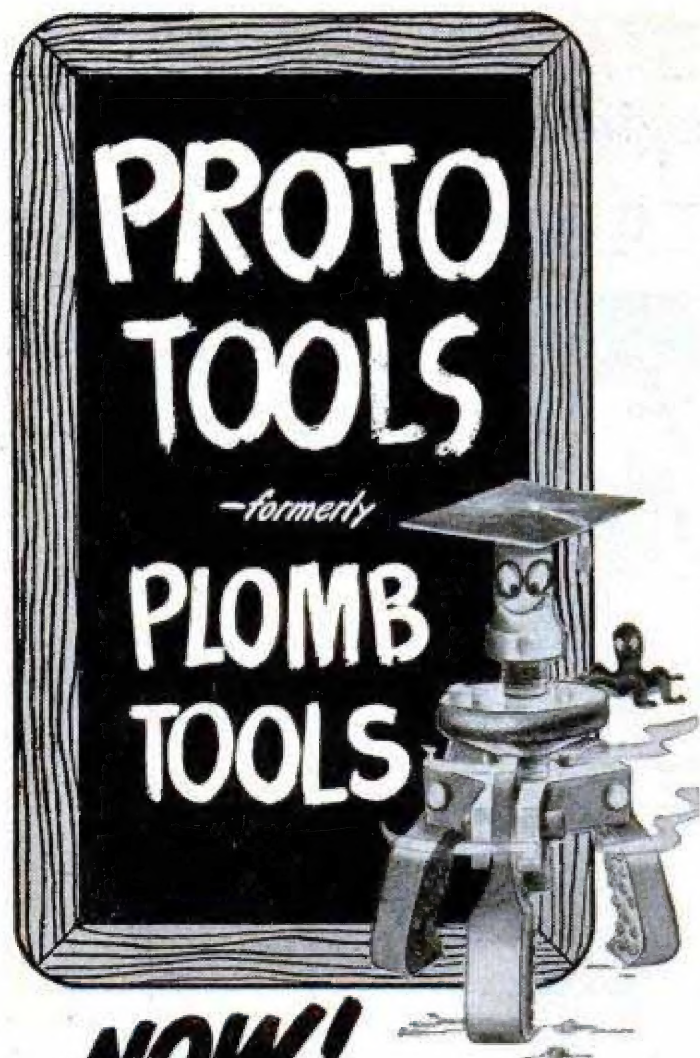
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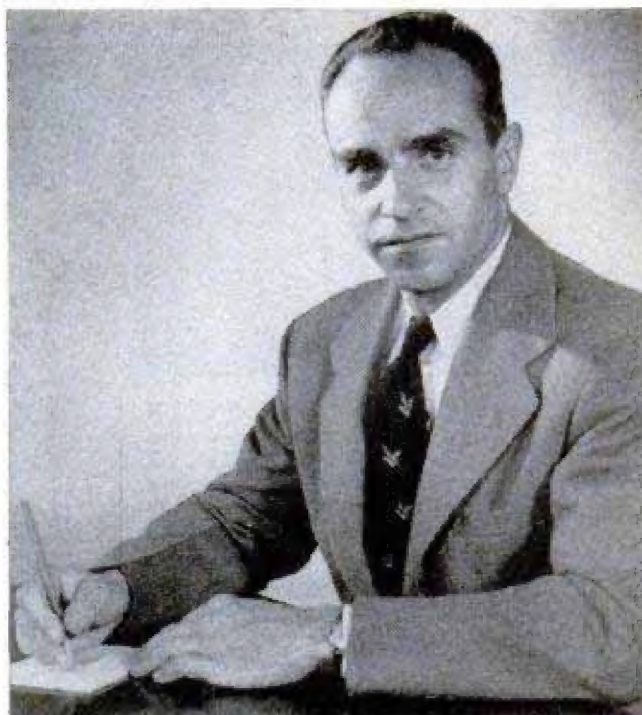
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4987



in this corner.....

**THE
EDITORS**



New Eastern Editor

Meet Richard F. Dempewolff, our new eastern editor at New York, whose by-line you will be seeing on many forthcoming articles. Mr. Dempewolff, a native New Yorker, comes to *Popular Mechanics* with a brilliant background as a writer and editor. During the war, when he served as a lieutenant in the Navy, he was roving correspondent and technical editor for a naval aviation publication. In his spare time he wrote his second book, "Animal Reveille," a story of animals that were helping win the war. His first book was "Famous Old New England Murders." After graduating from Middlebury (Vt.) College in 1936, Mr. Dempewolff went to work for the Literary Digest. He later served as an editor for Newsweek and as managing editor of True and Pic. His articles have appeared in many leading magazines including the Saturday Evening Post, Collier's and Reader's Digest. Mr. Dempewolff will have offices in the Empire State Building and his coverage for *Popular Mechanics* will extend over the eastern seaboard. He makes his home in Chappaqua, a suburb of New York, where he lives with his wife, Rita, and 5-year-old daughter, Judy. His hobbies include movie and still photography, flying and hunting.

(Continued to page 8)



IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

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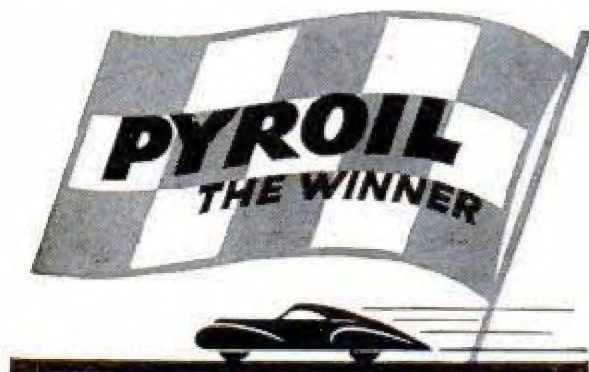
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Letter to the Editor:

I have had the occasion to see in the French edition, *Mecanique Populaire*, of which I am a steady reader, the pictures of a modified jeep. In return, I am sending you pictures of a jeep arranged according to the ideas of an engineer and of a body maker; the chassis has been elongated a little, as in the Jeepster.



The body is the shell of a front-drive Citroen. The hood and the front fenders are those of a 202 Peugeot. The trunk is from a 1938 Hotchkiss. The hood decoration comes from a 1939 Opel Kapitän. The steering wheel is the steering wheel of a 1940 Delahaye. As for the bumpers, not yet placed, they will be those of a 1936 Chrysler.

Hoping that this photo will interest you and perhaps you will publish it, I am

Very truly yours,
Frederic Orth,
Meylan, Isere, France.

* * *

Next Month

Oceanographers bring to the surface for you exciting information about the existence of a mysterious deep stratum in the ocean, to be told in next month's "Deep Sea Mystery Story." Official U. S. Navy photographs permit you to look over the shoulders of the scientists as they explore the depths. If you are among the millions curious about the automotive industry's plans for 1950, you'll want to see and read about what two of the major companies are leading off with for new-car buyers. A story on how to paint your house starts a series of articles on home repairs in the Craftsman section. Another feature, by a well-known authority on car care, lists the essential points to cover in preparing your car for winter driving. Photography fans will find an inexpensive remote "slave" flash synchronizer in the Radio and Electronics section next month.

What's ahead?



A world of rapid changes and new economic problems, that's certain. Just as surely, however, there's *one* thing that will be unchanged. In the near future and the long future, the important positions will be held by *trained men*.

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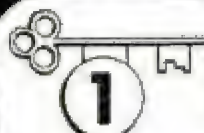
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IF A VETERAN: Length of Service in World War II _____

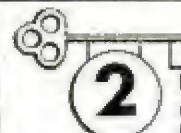
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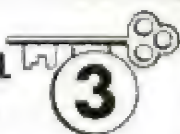
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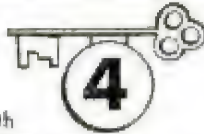
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TRAIN IN MIAMI--AIR CAPITAL OF THE WORLD

WHERE-TO-BUY-IT INDEX

Source of supply appears after items commercially available. For additional information on articles, write Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11

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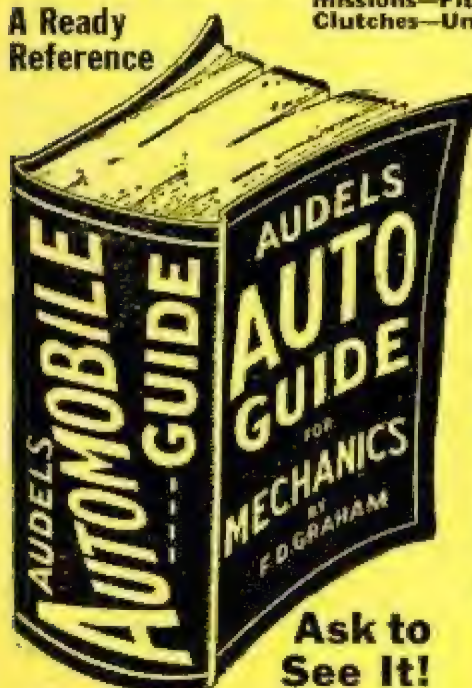
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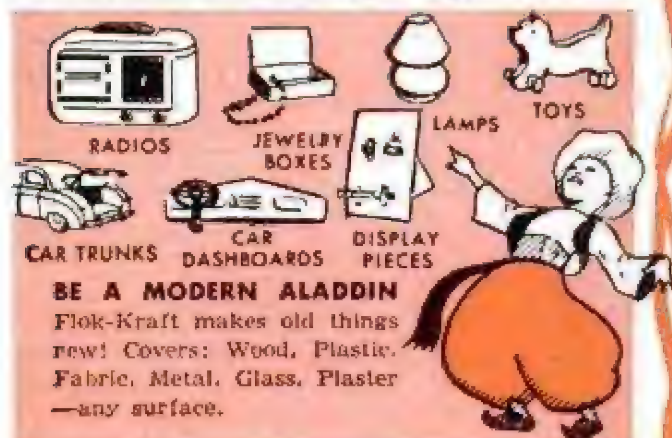
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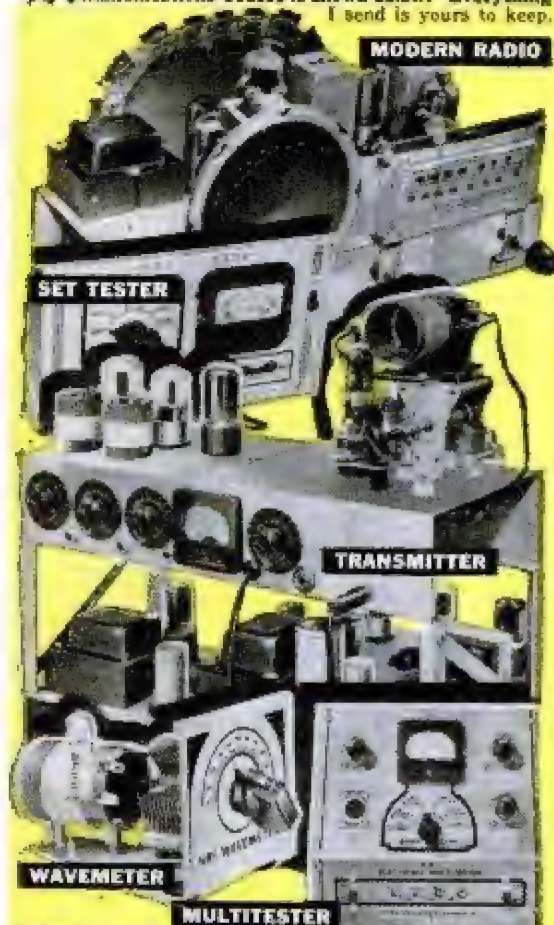
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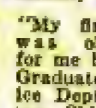
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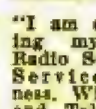
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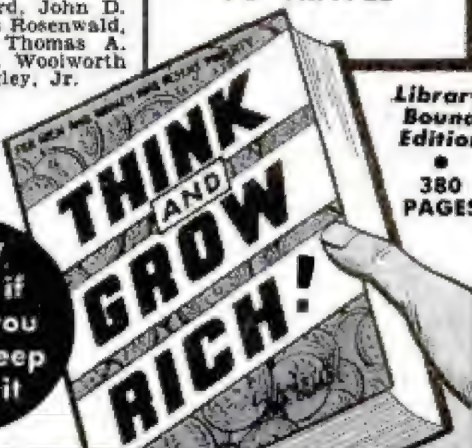
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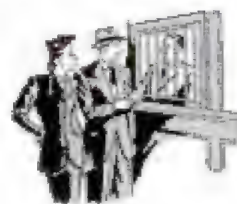
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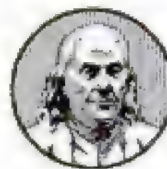
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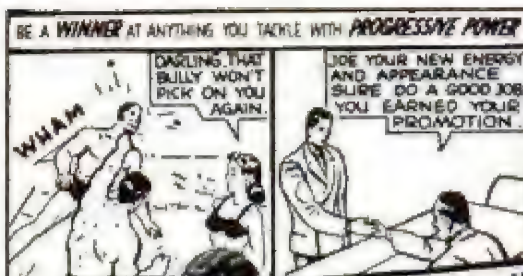
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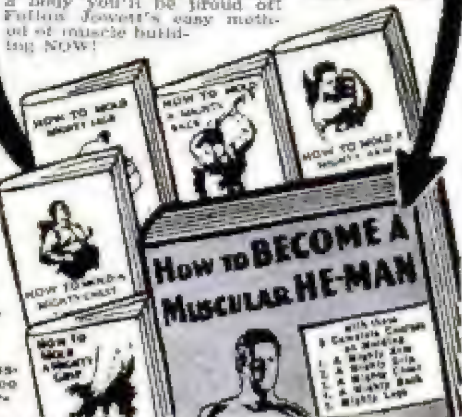
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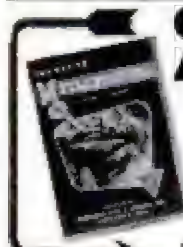
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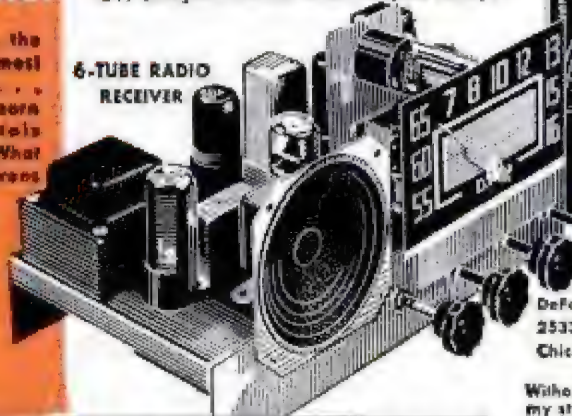
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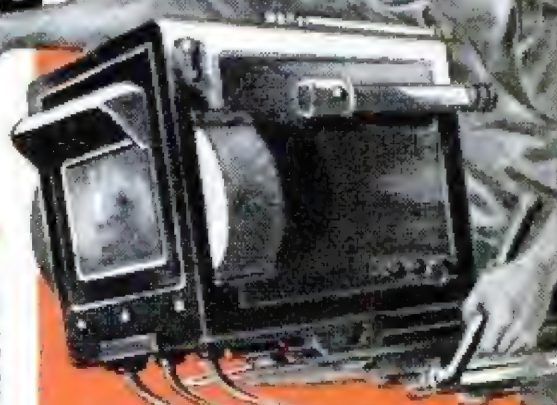
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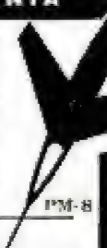
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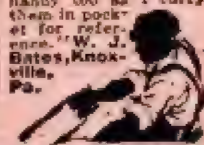
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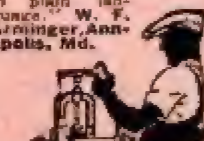
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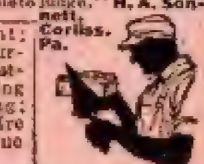
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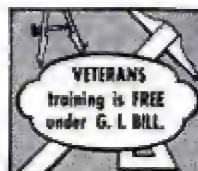
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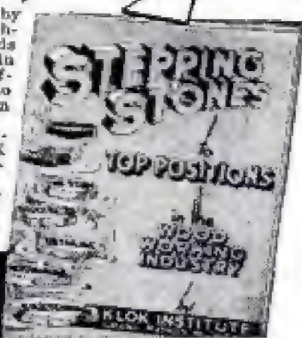
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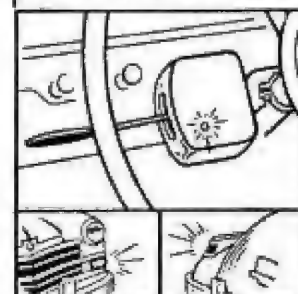
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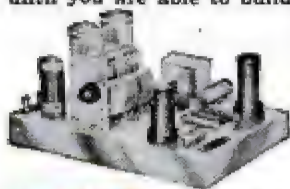


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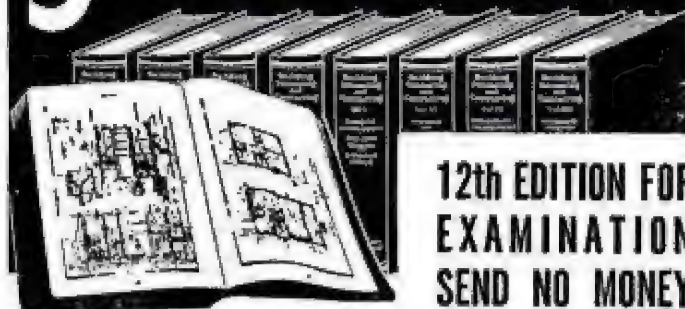
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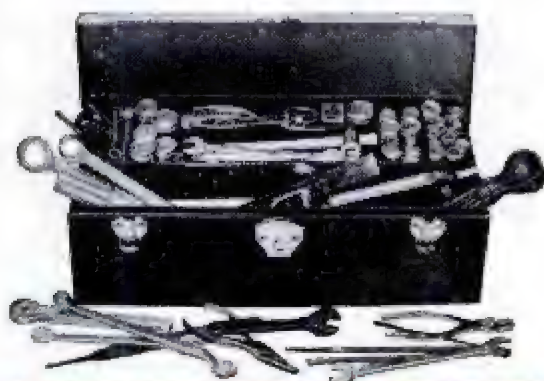
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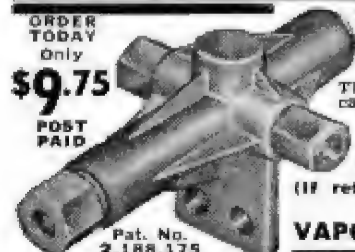
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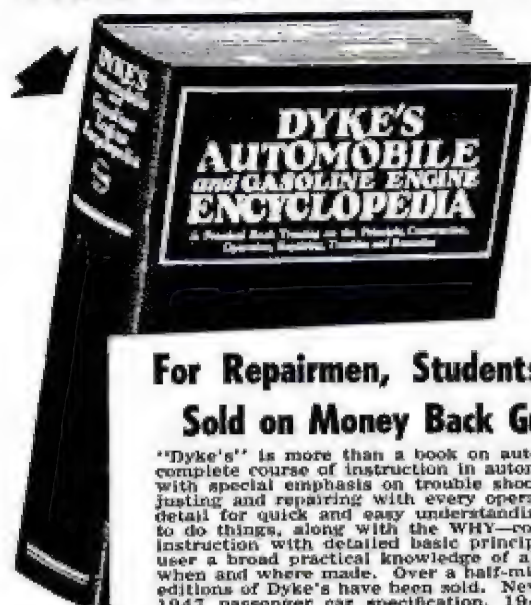
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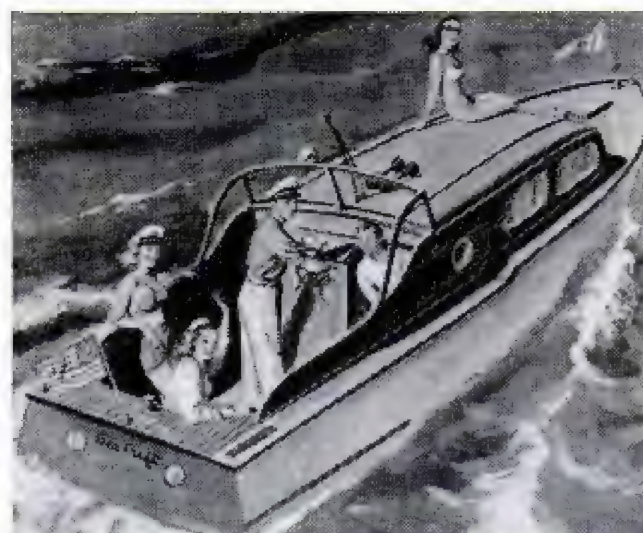
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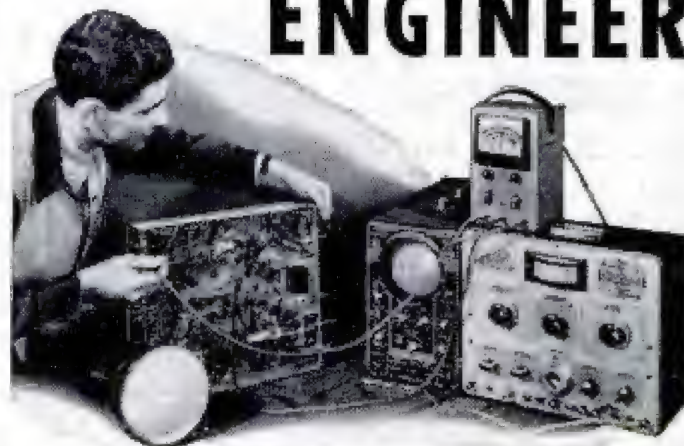
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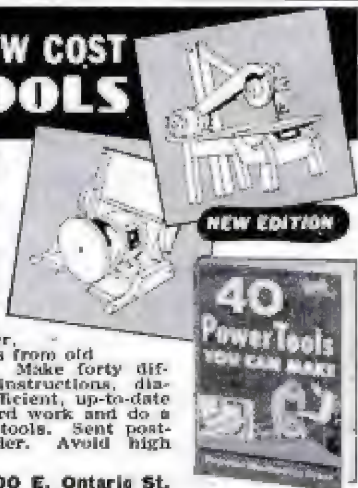
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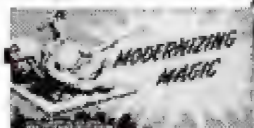
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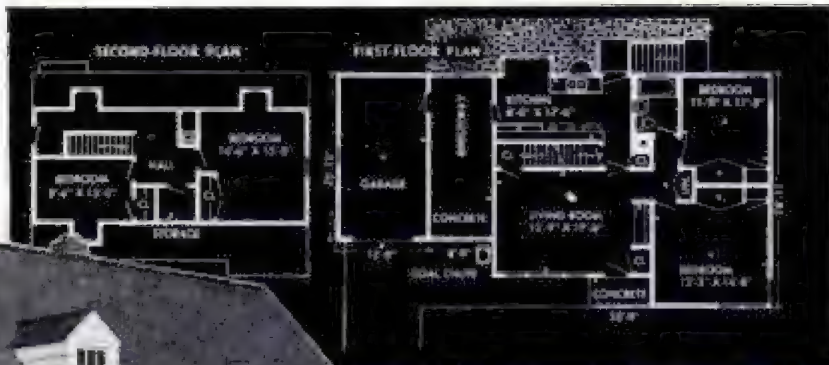
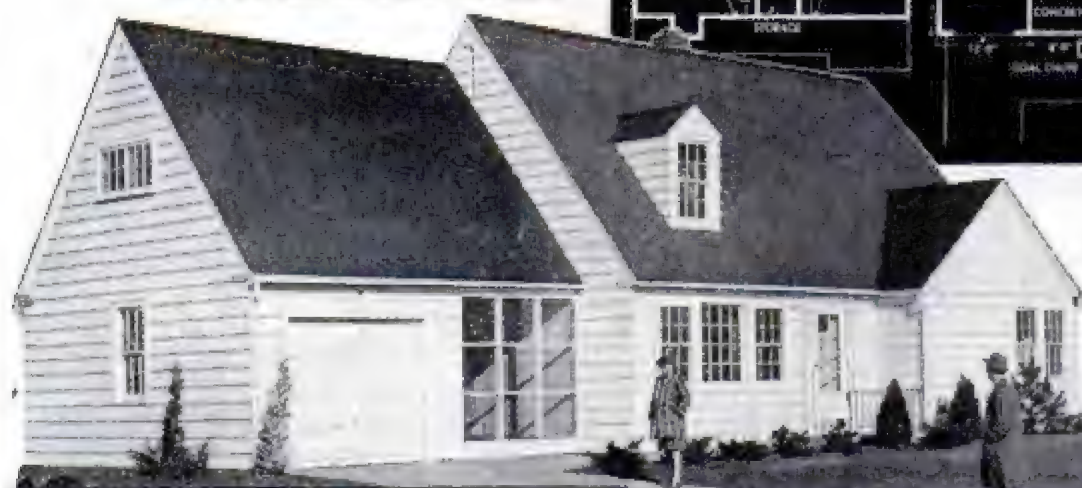
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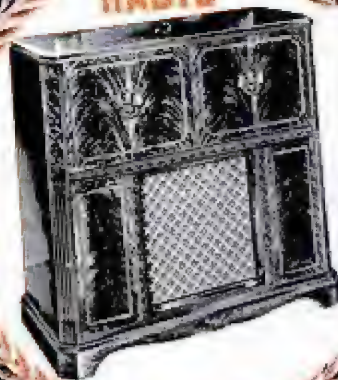
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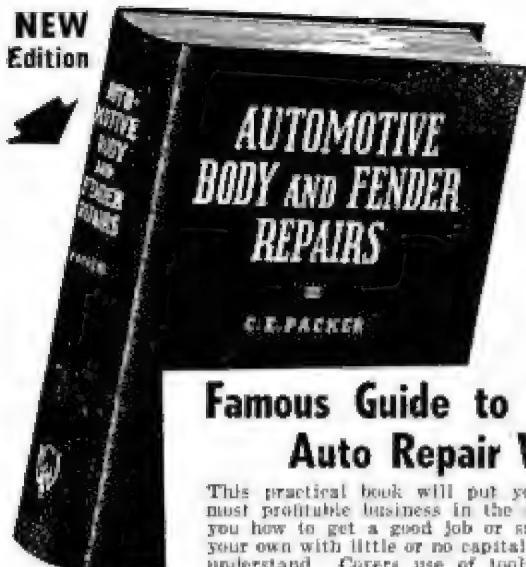
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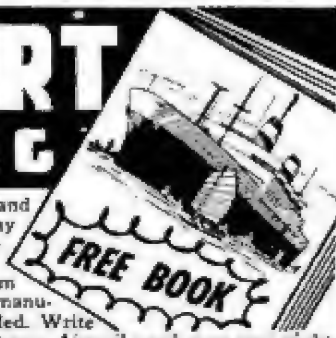
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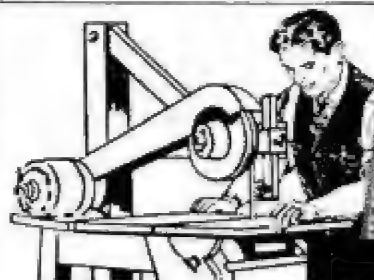
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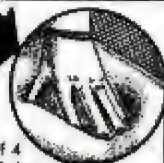
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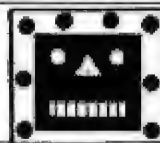
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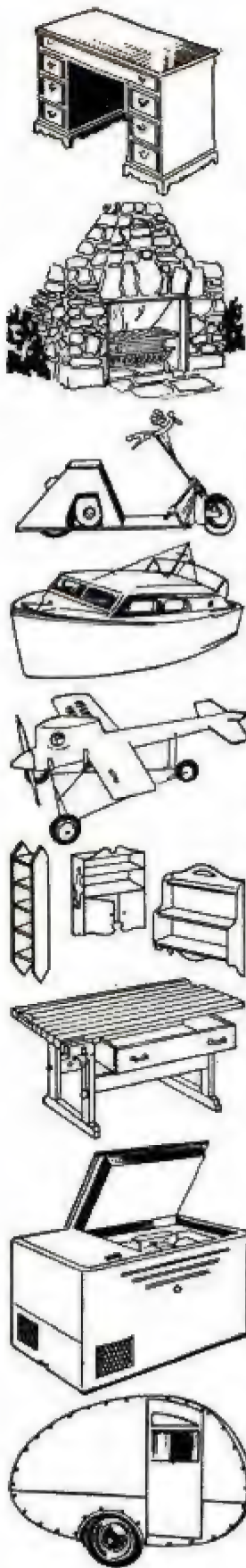
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WILL You be the next to have an accident due to dry front wheel bearings? Get Douglass inside grease seals for the front wheels of your car and be safe. Distributors wanted. Luberlain, \$2.85 a set factory to you. Weichhart Mfg. Co., 237 Natoma St., San Francisco 3, Calif. No c.o.d.

SAVINGS To 50% on generators, starters, voltage regulators, 6-32 volts, distributors, armatures, magnetos, carburetors, fuel pumps, windshield wipers, radiators. "Old models in stock" free list. State Ignition, 2621 Indiana, Chicago 16.

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AUTOISTS: Truck drivers, salesmen, tourists need this convenient pencil, notepad, or map holder on visor. For quick delivery, mail your printed address and forty cents to R. E. K. Manufacturing, 4530 Woodward, Detroit 2, Michigan.

ATTENTION Garagemen, truck owners and automobile dealers. Lowest prices. Auto and truck parts. Complete stock. Prompt replies. Babbitt Automotive, 2833 Chicago Avenue, Chicago 22.

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BUICK Parts—Enjoy new-car pep and power in your old Buick. Same day service from world's largest stock of new (not rebuilt) Buick parts and engines. Ship anywhere. Write today. Robertson Buick Co., 1001 S. Wabash Ave., Chicago 5, Ill.

AUTO Parts. Buy direct. Get dealers' prices. Represent us in your territory. Write requirements. Specify car make. Mechanics Auto Parts, Factory Warehouse, 3807-PM N. Ashland, Chicago 13.

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GOVERNMENT Surplus. Low voltage circuit tester in steel box. Cost \$202.00. Our price \$27.50. Will test batteries, starters, generators, voltage regulators, grounds, short circuits. Will Electrical Company, 7829 S. Racine Ave., Chicago 20, Ill.

AUTO Parts for all cars, transmissions, motors, differentials, fenders, carburetors. Security Auto Parts, 1923-PM Grace, Chicago 13.

CHEVROLET Parts. Scarce motor, body, sheet metal parts. Grossman Chevrolet, Minneapolis, Minnesota.

HARD-TO-GET Auto body parts. We supply. Miller Auto Parts Service, 193 N. Clark Street, Chicago.

BRUSH Plating outfits connect to a battery. No tanks or shop required. Free particulars. Gunmetal Co., Avenue J, Decatur, Illinois.

NATIONALLY Known parts at wholesale prices. Give year, make and model. Ship c.o.d. Parts, P.O. Box 325, Williamstown, Conn.

CUSTOM Styled chrome auto accessories. See our ad on page 49. Autogram, Inc., Dept. M, 3242 N. Pulaski Rd., Chicago 41, Illinois.

VAPOJET Gives car jet performance. Saves gas. See page 41.

AUTO TRAILERS

TRAILER Plans—House, utility, boat, etc. Axles, chassis, hitches, windows, etc. Catalog with booklet, "Trailer Hints," \$1.00. Catalog only, 50c. Marine Mart, Buffalo 7-B, N. Y.

BUILD Your own trailer! Save money! Have every feature you want! Plans for house, sport, camp and utility trailers. Catalog describing 9 models 10c, 15c in Canada and overseas. Jim Dandy, Box 125-A, Wausau, Wisconsin.

MOTORCYCLES, BICYCLES, MOTORSCOOTERS AND SUPPLIES

BICYCLE Supplies, wholesale, retail. List 10c. Universal, 4713 Virginia, St. Louis, Missouri.

POWERCYCLES. New—Factory overstock. Latest models. \$98.50 up plus tax and freight. Regular \$179.50 to \$267.50 values. Amazing buy. Regular factory warranty. Send for free catalog. R. C. Cheney Co., Mfg. Division, La Crosse, Wis.

POWERBIKES—Bargain prices. Literature 5c. Johnson's Scooter Sales, Milford, Indiana.

WORLD'S First jet turbine bicycle engine. Fits any bike. Smooth, economical. \$150.00. Dealers wanted. Literature 25c. Jet Engine Co., St. Augustine, Fla.

USED Motorscooter \$4.50, motorbike \$5, midget racer \$10, new Regal motorscooter \$37.50, less motors. Super-Cycles, Cushman's, Salsburys, Briggs motor \$3, others \$2 up. New motorbike conversions \$5. Plenty of brand new motorscooters, midget cars, homebuilders parts, automatic clutches, transmissions, engines, tires, etc. at factory prices. Special sale: Four balloon tires for \$3. Over 4500 tires in stock. Mailorder only. Send 25c for big war-bargain catalogue number 31, just out, listing these and hundreds of other bargains. (35c by first class mail). Midget Motors Directory, Athens, Ohio.

HARLEY-DAVIDSON Parts, accessories, oil, expert service. Tires all sizes. Send \$2.25 for Army 45 motorcycle manual. 25c for accessory catalog and bulletins. Knuth's (Harley-Davidson Dealers), 2491 Fondulac, Milwaukee, Wis.

MOTORCYCLE Monthly — Worldwide News. Generously illustrated. Year's subscription \$1.00. Sample 15c. Motorcycle News, 5424-A Sawyer, Chicago 25.

HARLEY-DAVIDSON 125 — America's outstanding lightweight powercycle. Floor models and demonstrators at a saving. Send 10c for bulletin. Knuth's, 1753 Muskego, Milwaukee, Wis.

COMPLETE One stop Harley Davidson sales service. Comprehensive accessory catalogue 25c. 813 Ohio St., Wichita Falls, Texas.

COMPLETE Parts for all American motorcycles from 1940. Also automatic clutches, generators, tires, chain. Motor parts. Laussen and Briggs and Stratton engines available. Moto-Scoot, Inc., 1323 W. Carroll Ave., Chicago, Ill.

CUSHMAN Motorscooter (4 H.P. motor) \$19.98 complete; Midget car (leather seat) \$25.00; Motorscoot \$15.00; 1946 Whizzer \$35.00; Motorbike outfit \$5.00; Indian motorcycle \$30.00. Other motorscooters \$8.00 up, motors \$3.00 up. Send 25c for new summer catalog listing many other sensational bargains in used motors, motorscooters, motorcycles, parts, etc. Associated, Box 1764-CS, Toledo, Ohio.

WHIZZER Bike-motor \$25.00; Cushman motorscooter \$15.00; midget racer \$40.00; Shaw bicycle-motor \$15.00; Harley-Davidson motorcycle \$15.00; Smith motor-wheel \$25.00; Good motorscooter (twist grip) \$22.50. Rush 25c for new catalog #14 listing many other amazing bargains in motorcycles, used motors, midget cars, parts, wheels, etc. Gail, 538 Erie, Toledo, Ohio.

HARLEY-DAVIDSON Parts, accessories, batteries, and tires. 24 hour service. Authorized factory dealer. Philadelphia Harley-Davidson Company, 857 North Broad Street, Philadelphia 23, Penna.

MOTORSCOOTERS. New design. 6 big features. Literature 10c. Rollaway Motors, Lancaster, N. H.

RECONDITIONED Motorcycles and motors. Chromium accessories. Complete stock Indian parts. Expert rebuilding. Fast service. Indian Motorcycle Sales, Kansas City 1, Mo.

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TIRES And industrial wheels, suitable for scooters, wheelbarrows, farm equipment, etc. All sizes. Bicycles and accessories. Largest assortment in America. Send dime for list. Cycle Transport Company, 1241 So. Michigan Ave., Chicago 5, Illinois.

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PROPELLERS, Plans, skis, engines, for ice-snow sleighs, air boats. Literature 10c. Banks-Maxwell, R.F.D. 12, Ft. Worth.

PROPELLERS—2-3 Blade for sleds, air-drive boats. Catalog. Standard Aero Craft, Box 387, Ft. Worth, Texas.

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BUILD—1,500 Watt 110 volt A.C. generator from old 12 volt Dodge generator. Constant voltage with volt regulator. Variable speed. Plans and instructions guaranteed. \$1.00. A. J. Allen Service, P.O. Box 1432, Del Valle Station, Dept. P.M., Los Angeles 15, Calif.

EDISON Non-acid lifetime storage batteries for home lighting, motors, industrial uses, radios, etc. Free interesting literature. Hawley Smith Co., Croton Falls 1, N. Y.

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FIX Anything electrical. Amazing new "Electroscope" at unheard of low price—locates electrical troubles double quick. Basic course in electrical repair included free with each "Electroscope." Send penny postcard for full details, no obligation. Feller Engineering Company, Dept. 8PM9E, 945 George Street, Chicago 14, Illinois.

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LAMPS—Build own originals. Parts wholesale, any amounts. Catalogue 10c. Brown Lamp Co., Box 501, Wellston, St. Louis 12, Mo.

BUY Lamp parts wholesale. Parts you need for building, repairing, or assembling. Save money on large or small orders. New catalog for 10c. Gearon Company, Dept. 300-B4, 27 South Desplaines, Chicago, Illinois.

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SILICON Transformer lamination cut to order. Magnet wire, supplies. Send for bulletin 42948M. Morton Electrical Service, Maywood, Ill.

ELECTRIC Pencil: Engraves all metals \$1.25. Beyer Mfg., 10511-H Springfield, Chicago 43.

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"BUILD-UR-OWN" Portable arc welder. Save \$350. Easy with Hobart welder plus auto engine. Send 10c for valuable instruction book. Free catalog. Write Hobartweld, Box M-893, Troy, Ohio.

RECTIFIERS 0-4 V.D.C. \$9.50, 0-8 V.D.C. \$12.50, 0-12 V.D.C. \$18.50. All 0-100 amps. Starkweather, Ottawa, Kansas.

WELDERS 110V. Welds $\frac{1}{2}$ " steel. \$32.50. Unassembled \$22.50. Morris Welding Service, 1850A State, Schenectady 4, N. Y.

WELDER New portable Champion special transformer welder; 110/120 volts a.c. develops to 75 amps.; 9 heat stages. Welds, brazes, solders, cuts all metals. Easy to use. Simple instructions. Special flame weld torch free. Splendid for shop, farm, home repairs. Saves hundreds of dollars yearly. Only \$27.50. Also heavier models. 10 day free trial. Magic Welder Co., 239 MP Canal St., New York, N. Y.

WELDERS For all requirements. Free catalog. Write Hobartweld, Box M-894, Troy, Ohio.

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DIAL Heat adjustment rheostat and 0-800 ammeter on panel for mounting on P-1, P-2, R-1, R-2 aircraft gen. welders. \$14.95 postpaid. H & H Welding Supply, Ryus, Kans.

RADIATOR Repairing, cleaning, recording. How to equip small shop at low cost. Supply sources, trade secrets, instructions. Now only \$3.50 postpaid. Radiator Service, McBain, Mich.

AUTO Radiator repairing supplies, equipment, books, gasoline torch. Write, Curfman Co., Maryville, Mo.

BUY Direct from factory. Welding outfit, \$48.36. Soldering outfits \$7.76 to \$10.16 complete prepaid. Box 331, Hamilton, Ohio.

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SNAP Center finder. \$1.00 postpaid. Earl Engineering Co., P.O. Box 52, Fresno, California.

WELDERS For all requirements. Free catalog. Write Hobartweld, Box M-895, Troy, Ohio.

MAGNETIC Tool holder. Screws on wall. Don't clutter your work table. Guaranteed permanent magnetism. Satisfaction or money refunded. \$2.95, postpaid or c.o.d. Ace Specialties, 435-A Market Street, Bloomsburg, Penna.

$\frac{1}{4}$ " **ELECTRIC** Drill \$8.95. $\frac{1}{2}$ " electric drill \$22.95. $\frac{1}{4}$ hp. bench grinder \$22.95. New and guaranteed. catalog 10c. Box 1161, Oklahoma City, Oklahoma.

THE Acme sharpener will produce a smooth, fast cutting edge on any kind of circular saw. Send for free literature. Max Mfg. Co., 138 Stockton Ave., San Jose 11, California.

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CONCRETE Block machines. Standard sizes, economical, dependable, low prices. \$39.50. Free catalog. Concrete Machine Co., 5129 S. Compton, St. Louis, Mo.

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DRILL Grinder for twist drills. \$2.95. See ad on page 253.

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BUILD A better boat than you can buy for the money! Save 35-55%. Exclusive laminated ribbed construction, prefabricated for easy assembly. All popular types from simple car-top models to mahogany-decked runabouts, priced from \$39.50 to \$109.50. Send 10c for literature. Ozarka Boats, 689 Borden Lane, Woodstock, Ill.

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BOAT Builders' guide—250 pages, 15,000 items pictured, priced, deliverable. Send \$1.00. Marine Mart, Buffalo 7-B, N. Y.

BOAT Plans: Wood-steel. Catalog. John B. Clark, Yacht Designer, 329P Kenmore, Bay Village, Ohio.

KNOCK-DOWN Boat kits. Outboards, inboards, sail, hydroplanes. Easy to assemble, minimum cost. Catalog with specifications, prices 25c. Brooks Boat Company, Carrollton PT, Michigan.

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SAVE $\frac{2}{3}$ Cost. Build your own boat with our ready cut parts by the Welch system. No experience necessary. Rowboats to cruisers. Illustrated catalog 25c. Midwest Boat Company, Menomonee Falls, Wisconsin.

OUTBOARD Motors—Used bargains, \$45 up, free list. Used parts, most models, save money! Boat and motor equipment and accessories. Big catalog, send dime. Grandall-Hicks, 911 Commonwealth, Boston, Mass.

NEW, Used, rebuilt marine motors. Marine conversions, fittings. Free catalog. Stokes Marine Supply, Dept. 24, Coldwater, Michigan.

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WATER Motors—All sizes. For any purpose. Rotary and semi rotary. Duplex Motors, Burlington, Iowa.

WINDING Data, listing 225 motors, single and three phase, \$1.00. Motor Data Co., Box 7631, Kansas City 3, Mo.

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BECOME A big strong muscleman. Instructions only \$2.00. News and pictures 10c. Barbell equipment. Personal supervision, etc. Write Sid's System, PM12, 8421 $\frac{1}{2}$ Evergreen, Southgate, California.

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BOWS, Arrows. Quality archery equipment. Popular prices. Catalog 10c. Illustrated archery instruction book 50c. Archery, 617-K So. State, Chicago 5.

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"MODERN Taxidermist Magazine," Greenfield Center, N. Y. Devoted exclusively to taxidermy. Two sample copies 25c.

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"TERRIFIC" Bargains — Government surplus telescopes, binoculars. Send \$1.00 for 10 piece hobbyist lens set. Contains magnifying and reducing lenses. Send stamp for "bargain" list. P. Jaegers, 93-08 95th Ave., Ozone Park 16, N. Y.

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POWERFUL Astronomical telescopes easily made. Perfect lenses and instructions. 100X \$3.00. 100X and 200X \$4.00. 100X, 200X and 400X \$5.00. Clear vision, full power guaranteed. Instructions alone 10c. Suffolk Science Service, Manorville, N. Y.

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FERRETS \$10. Mink kits \$15 up. Van Garp Ranch, Pella, Iowa.

RAISE Rabbits. Four pound fryers in eight weeks. Ready market for meat, fur, wool. Illustrated book, describing leading breeds, housing, breeding, feeding, marketing. By America's largest rabbit association. 10 cents. American Association 12, AR & CBA Building, Pittsburgh 17, Pennsylvania.

SPORTSMEN: 200 Pointers, setters, straight cooners, combination hunters, rabbit and fox hounds. Reasonable. List free. Ramsey Creek Kennels, Ramsey, Ill.

SEE Gulf Hamstery ad on page 33. Shows picture of Hamster.

ANGORA Rabbits for pleasure and profit. Fred Wellen, Elkhart, Iowa.

\$400 MONTHLY. Raising Angora rabbits. Good wool markets. Details free. White's Rabbitry, Newark, Ohio.

HOHL'S Hamsters. Clean, quiet, odorless pets. Photo, literature free. Lab. Stock, 317-M Mt. Vernon Rd., Newark, Ohio.

HAMSTERS—Guaranteed virgin breeders. \$5.00 pair. Order direct. Wholesale business solicited. Pyle Hamstery, Okmulgee, Oklahoma.

\$300 MONTHLY Raising Angoras for our market. Particulars free. Wilson, Stanton, Calif.

ENGLISH Shepherds, puppies, spayed females. Heelers livestock, companion children. Best watchers. Barnes, Collyer, Kans.

RAISING Hamsters is profitable. Information. Pem's Hamstery, 3010-10th Ave., No., St. Petersburg 5, Fla.

MAKE Extra cash. Raise Giant Chinchilla rabbits. Waters Rabbit Farm, Glennville, Ga.

MINE Raising information free. Complete, Lake Superior Mink Farm, Superior, EE1, Wisconsin.

INCREASE Your income by raising domestic rabbits. Small space needed. Ready market for delicious meat, fur and wool. Largest magazine in the industry tells you how. \$1.50 per year. Sample 15 cents. No stamps. Small Stock Magazine, Lamoni 20, Iowa.

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SPECIAL Ozark land buys. Free descriptions. Write Armstrong, Shook, Mo.

WEST'S New time and money saving catalogue, over 1000 farm and business bargains. Free. West's Farm Agency, CK-2, Pittsburgh 17, Penna.

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STROUT'S Farm catalog! Time and money-saver—Free! Describes 2790 bargain properties, 35 states coast-to-coast. Write today for your free copy! Strout Realty, 255-P 4th Ave., New York 10, N. Y. 26 W. 9th St., Kansas City 6, Mo. 453 S. Spring, Los Angeles 13, Calif.

\$5.00 MONTHLY Buys 40 acres near town; price \$200.00. Free list. Box 425-P, Carthage, Mo.

GOVERNMENT Lands \$2.00 acre up. Information all states twenty-five cents. National Tax Service, 901-A Majestic Bldg., Detroit.

GOOD Farms—Ranches. Washington, Minnesota, Montana, Idaho, Oregon, North Dakota. Dependable crops, favorable climate. Write for literature, lists describing typical farm opportunities. Specify which state. J. W. Haw, 119 Northern Pacific Railway, St. Paul 1, Minn.

SOLD For taxes. Calif., Oregon, Washington timber, grazing, ranch and mining lands. 25c to \$3 acre min. bid. 10c (coin) brings circulars, photos, maps. Pacific Lands, Box 2350-PM, Hollywood, Calif.

OZARK Magazine. Eureka Springs 11, Arkansas. For homeseekers, tourists. Year, \$1.50.

LOTS \$300—Convenient payments. California's finest garden section. On Morro Bay's scenic shores. Wonderful fishing, hunting, boating, bathing. Fertile soil, softest water, temperate climate, congenial community. Free literature. Richard Otto, Department M, San Luis Obispo, California.

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RUSH Card—Five profitable small capital mail sales propositions free. Schenck, 717-P W. Penn, Butler, Penna.

FORMULAS, PLANS, ETC.

PRODUCTS Analyzed. Duplicated. Improved. Formulas. Consulting Scientific Company, Swarthmore, Pennsylvania.

MAKE—Sell cleaners, soaps, polishes, flavors, cosmetics. No machinery. Formula literature free. Kemico, Park Ridge 16, Illinois.

FORMULAS. Processes. analysis. Free literature. Pricopoulos, 761 Worthington, Springfield 5, Massachusetts.

10,000 FORMULAS And trade secrets. Free literature. Stillman, 555 Kingston Ave., Brooklyn 3, N. Y.

24 MONEYMAKERS—Tested formulas for home manufacturing, 25c. Satisfaction guaranteed. Details free. Nelson, Howel, Kentucky.

11,148 FORMULAS. Postal brings literature. Formulab, 1707 Maryfield, Ann Arbor, Michigan.

FORMULAS For nearly everything. Catalog free. Write Creative, Winnetka, Ill.

TESTED Formulas. Interesting descriptive booklet free. Pont, Box 635-PM, Terre Haute, Indiana.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

PLASTICS

FLEXIBLE Mold makers handbook. Be an expert. Send only \$1.00 for your postpaid copy today. Multi-Mold Products, 265 West 30 Street, New York 1.

LUCITE, Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16" 95c; 1/8", \$1.25; 3/16", \$1.50; 1/4", \$1.80. Colors add 10%. Include 10% postage. Almac Plastics, 230 Fifth Avenue, New York 1, N. Y.

NEW Liquid plastic. Clear, colors. Cast without heat. Embed flowers, insects, coins. Saw, drill, carve. Complete kit only \$3.95 postpaid, or send 25c for exciting new home project manual showing how to get started. Castolite, Dept. J-101, Woodstock, Ill.

PLEXIGLAS. Clear, colored, masked sheets, 76c per sq. ft., 1/16; 99c, 1/8; \$1.21, 3/16; \$1.43, 1/4; \$1.86, 5/8. Internal carving blocks \$1.00 lb. Write Hub, 358P Congress, Boston, Mass.

"CASTING Plastics"—Latest edition of famous manual, \$1 per copy. Plastics Research, Box 346, Alhambra, Calif.

WHOLESALE Plastics supply catalog. 10c. Lucite, clear, colored. Metallic Acetate. Complete Castolite line. Phosphorescent, pearling pigments, dyes. Metal findings. Tools. Ideas and bargains galore. Fast delivery from stock. Gem-O-Lite, Box 686E, North Hollywood, Calif.

PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

CHEMISTRY

MAKE Chemistry your hobby. Fascinating, educational, recreational, vocational. Large general catalogue. Chemicals and apparatus 15c. Microscopic stain catalogue 20c. Both for 25c. National Scientific Company, (Est. 1916), 2204 W. North Ave., Chicago 47, Ill.

HANDBOOK For chemical experimenters, illustrated, hundreds of experiments, 50c. Experiment booklet, 15c. Reading Scientific Company, Reading, Penna.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 15c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

NEW Catalog: Chemistry, mineralogy, biology, 10c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-50, Biological Supply Co., 1178 Mt. Hope Ave., Rochester, 7, N. Y.

HELP WANTED

APPLIANCE Designer. Well established company in mid-west has permanent salary position for a man 35 years of age or under to design, develop and follow through on mechanical and electrical household applying and dispensing equipment. Write fully stating experience, salary requirements, and give references. All replies will be held confidential. M. Leve, Room 1158, Merchandise Mart, Chicago 54, Ill.

BOYS Wanted. Over \$2.00 hour! Sell name plates for front doors. Free sample. Write Dept. 51, National Engravers, 214 Summer, Boston, Mass.

HIGH School students—Earn big money selling our custom club emblems, "T" shirts, novelties, pins, decals and trophies at your school. Write for free literature. Jest-Art, Dept. M, Culver City, California.

AGENTS WANTED

AT Last! Something new and sensational in Christmas cards. Show gorgeous satins, velours and plastics never before offered. Gets easy orders fast! Pays big profits. Free samples of Christmas cards with name 50 for \$1, imprinted stationery, floral charmettes, napkins. 50 other assortments 60c to \$1.25. Samples on approval. Write: Puro Co., 2801 Locust, Dept. 040-K, St. Louis, Mo.

EXTRA Money yours—easy! Profits to 100%. Sell thrilling value plastic Christmas cards, 50 for \$1.00 personals, everyday, religious, children's, gift wrap assortments. Request deluxe 21-card \$1.00 Christmas assortment, name imprinted Christmas cards. Stationery samples on approval. Holiday Card Co., 463 Congress St., Dept. C, Portland, Maine.

EARN Extra money easily, sell new Christmas cards and gifts—n-things. 21 folder ass't, sells for \$1.00, sent on approval; no investment. Get \$50 or more selling only 100 boxes. Amazing sample offers. Headquarters for new 3-dimensional Christmas cards. Plastics, genuine engraved etchings. We send free samples of easy-to-sell personal Christmas cards and stationery. Pen 'n Brush Studios, Dept. PM-9, 139 Duane St., New York 13, N. Y.

EXTRA Money! Sell friends Christmas cards—including fascinating plastics. 100% profit. Request free samples exclusive name-imprinted Christmas cards, stationery unobtainable elsewhere with Christmas and everyday assortments on approval. Regal Greetings, Dept. PM-3, Hazel Park, Mich.

QUICK, Easy, cash for you! Sell amazing variety new Christmas cards. Profits to 100%. Novel plastic, 3-dimension "Stage set," metallic, Christmas carol cards, gift wraps, animated books, table settings, 8 special offers. Bonus. Write for feature samples on approval and free samples 4 different name imprinted Christmas card lines, floral and personal stationery. Elmira Greeting Card Co., MB-109, Elmira, N. Y.

MAKE \$50 Selling only 100 boxes America's leading 21 card Christmas assortments. Samples on approval. Complete line plastics, wrappings. Free samples. 50 for \$1.00 name imprinted Christmas cards. Write Lorain Art Studios, Dept. AO, Vermillion, Ohio.

AMAZING Spare time earnings. Sell Christmas cards, stationery, napkins; 50 with name \$1.00. Complete line Christmas, everyday boxes. Profits to 100%. Write for samples. Empire Card, 135 Fox, Elmira, N. Y.

AMAZING Offer—\$40 is yours for selling only 50 boxes Christmas cards. Also 50 and 25 for \$1.00 with or without name. Free samples. Other boxes on approval, including entirely new, different deluxe assortment with feature television card. Cute plastic assortments. Write today. It costs nothing to try. Cheerful Card Co., 843, White Plains, N. Y.

SHINE Shoes without "polish." New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee, 132, Akron, Ohio.

\$1.00 STARTS You in business. Sell men's neckwear full or part-time. Low investment, big profits. Send \$1.00, receive two sample ties, plus free catalogue, color pictures, selling plan. Radio City Neckwear, Dept. M1, 112 W. 50th, New York City.

SELL Fluorescent plastic signs. Iwano Plastic Products, 9108 Olivet Avenue, Detroit 9, Michigan.

EXTRA Money quick! Take easy orders low cost; high profit Christmas cards. Wonderful new type plastic, metallic assortments. Send at once for free 48-page catalog, feature samples on approval and free name imprinted Christmas card sample portfolios. Special offers. New England Art Publishers, North Abington 51, Mass.

EARN Extra money! Make up to 100% profit selling personalized Christmas cards, stationery, napkins, matches, playing cards, coasters and other personalized items. All items sell on sight. Request free catalogue. Lynne Novelty, 739 Riverside Ave., Elmira, N. Y.

FREE! Win television set and big cash prizes! Sensational offer. Make more money selling plastic Christmas cards. 50 and 25 for \$1.00, imprinted. Fast selling line, bonus. Free contest entry and portfolios. Richar's, 16AT East 18th, New York 3.

CHRISTMAS Cards. Earn \$5.00 with every ten 21 card \$1.00 boxes you sell. Also new \$1.00 plastic cards, personalized cards and stationery, note paper and wrappings. Send for samples today. Howard P. Ellis, Dept. PM-8, Pittman, N. J.

SELL Direct to homes, merchants, hundreds of items. Free catalogue. Champion Specialty, 818 Central, Kansas City 6, Missouri.

MUSIC Greeting cards. All occasions. Dorby Music Cards, P.O. Box 738, Morristown, New Jersey.

MAKE Money easily. New spare time plan. Up to 100% profit. No experience. Show unusual Christmas, everyday card assortments, plastics, gleam and glo, kiddies cards, wrappings. Attractive gift items. Bonus. Special offers. Send today for free samples 30 different Christmas cards with name. 30 for \$1.00 up, stationery, coasters. Thomas Terry Studios, 100 Union Ave., Westfield, Mass.

UP To 442% profits selling "Quick Determinging Atomic Metal Plates." Instantly cleans silverware, jewelry, metals. Wholesale, retail, sideline. Manufacturers, 508-PM9 New York St., Aurora, Illinois.

MEN, Women—Sell character building gift items. Send for samples on approval offer. Al Hawkins Company, Sioux City 7, Iowa.

YOU Can make big money selling Mayer stainless steel aluminum handle cutlery. Write now for particulars. Mayer Company, Waterloo, Iowa.

SELL Dress fabrics to friends, neighbors. Stylish, beautiful materials. Year round profits. No experience needed. Free details. National, 640 Broadway, Dept. M, New York 12.

BIG Bargains for big profits. Over 100 sensational values. Men's used suits \$2, pants 35c, topcoats \$1.25, overcoats \$2, shoes 20c. Experience unnecessary. Free wholesale catalog. Superior, 125B-A Jefferson, Chicago 7.

EARN Big money plus sensational bonus. Be a one person department store. Sell men's, women's, children's apparel and accessories, etc. Free sales equipment. Corporate Merchandisers, Dept. PM-16, 547 Broadway, New York City.

SELL Newest and fastest selling item in plastic. Patented cover for old style bath tubs. Beautiful pastel colors. Cost \$42.00 per dozen, sell for \$72.00 and up. All orders f.o.b. Chicago, cash or c.o.d. Minimum orders 7 dozen. Marlin Sales Co., 2060 Milwaukee Ave., Chicago, Ill.

SELL Amazing non-electric fluorescent signs. Extraordinary brilliance. Huge profits. Patented process. Send \$1.00 for fast-selling samples. Hatt Industries, 1412-A Great Northern Bldg., Chicago 4.

PROFITS. Big demand and repeat orders selling rubber mats for home or auto. Free sales plan. Mitchell, Dept. PM5, 2140 San Fernando Road, Los Angeles 41.

PLASTIC Tablecloth covers, curtains, drapes, baby pants, bowl covers and other plastic articles selling like wildfire! Make big money now! Free details. Write L & M Co., Dept. 58-H, 510 St. Charles, St. Louis, Mo.

A SURE Way to make money. No exp. needed; Christmas cards sell fast! From 50 for \$1.00 with name! Big line box assts; profit up to 100%. Write for samples on approval. Mendler Art Company, 37A Pearl Street, Boston, Mass.

CALL On friends with sensational Christmas cards in handy assortments. Sell for \$1.00. Profit up to 50c. Also popular-priced personal Christmas cards, everyday assortments, stationery, imported napkins. Samples on approval. Wallace Brown, Dept. B-4, New York 10, N. Y.

FREE Nylons given if Kendex hosiery runs or shags! World's only women's hosiery sold with written guarantee amazing everybody. Mere words could not express unbelievable money-making opportunity. Fantastic earnings become reality. Armstrong earned \$202 in 9 days. Watkins sent 92 orders in one day. Imagine replacing hosiery free regardless of cause—whether use or abuse! Truly sales dynamite for terrific profits. Even if you never sold before, three magic words: "Guaranteed Against Everything" will open doors for you—make women listen and pour money in your pocket. Complete line from sheerest to service (15-20-30-40-60 denier) all lengths 28 to 35 inches—latest colors—seamed full fashioned and seamless. No competition because Kendex guaranteed nylons not sold in stores. Also complete line men's hosiery actually guaranteed for one full year! Nothing like this anywhere. Includes rayon, nylon, lisle, wool, cotton, mixtures, etc. All styles, patterns, colors, prices to please everybody. Thousands shipped daily, 100,000 pairs constantly in stock for fast delivery. Over 30 years in business. You need no money or experience. Nothing to pay now or later. Show free outfits. Write orders. We deliver and collect. Big advance cash plus huge bonus. Earn money spare or full time—exclusively or side line. No restrictions. Become manager—appoint others to sell for you—earn steady income on their sales. Complete money-making outfits including salesbooks in color, samples of hosiery materials, etc. furnished free and prepaid. Simply mail name and address to: Kendex Company, Babylon 83, N. Y.

A Dress yours with every 3 you order for yourself and family. Amazing new bonus plan. Everything free. Harford Frocks, Dept. A-335, Cincinnati, Ohio.

DON'T Sell Junk! The Frawley chair-side coin radio is in America's finest hotels. Proven and accepted! Your local hotels, courts, hospitals, resorts, coin operators, investors, radio men, etc. are all prospects. Splendid commission! Time payment plan and complete sales helps for easy selling. Write today! Hotel Radio Corporation, 3000 E. Jefferson Ave., Detroit 7, Michigan.

POWER Mower—\$59.50. Home agents. Sensation. Earn yours; free. Smith Agency, S-2008, Excelsior Springs, Mo.

PAINTS—Enamels, Roofing 65c gal. up. Your name on label. Certified Products, 812E 38th, Louisville, Ky.

EARN Spare time cash. Sell Xmas, everyday cards, stationery, specialties. Profits to 100%. Bonus. Box sent on approval. Birchard, 27C Lester St., Springfield, Mass.

BRAND New! Amazingly different and smart Christmas cards bring you big money! Take easy orders for sensational new Christmas cards. Amazing values. Pays up to 100% cash profit. Big line of Christmas, everyday assortments from 60c up. Christmas cards with name 50 for \$1.00. Imprinted stationery, floral charmettes, napkins. Get samples on approval, imprints free. Write North Star, 31 Glenwood, Dept. A-18, Minneapolis, Minn.

BIG Profits. Every auto owner buys at \$1.50. Unusual but proven product. Guaranteed. Jackson, 728 W. Peachtree, Atlanta, Georgia.

MONEY Quick. Take easy orders sensational men's cushion shoe line. Build steady, repeat business your neighborhood. Free outfit. Concordian Shoes, 5-A, West Concord, Mass.

1949 CHRISTMAS Card catalog now ready! Earn more money! Be a wholesale jobber! A large selection of box assortments. Imprint lines, religious, personalized cards and Christmas novelties. Three sample boxes, retailing for \$2.60, only \$1.00 postpaid. Catalog free! Elfko, 440 North Wells, Chicago 10.

INCREASE Your income. Sell for manufacturer, Nylon uniforms to waitresses, beauticians, doctors, dentists, nurses. Sales outfit and extra catalogs with your name and address furnished free. Terrific cash commissions. Medikote, Rockville Centre 2, N. Y.

BIG Profits—Taking orders from friends, neighbors. 50 super value Christmas folders \$1.25 with name. America's leading \$1 box 21 French folders. Christmas Holly box—lined envelopes. Also: gift wrappings, plastics, religious, kiddies, napkins, stationery, etc. Samples on approval. No investment. Sunshine Art Studios, Dept. PM-8, 115 Fulton St., New York 4, N. Y.

NYLON Uniforms. Immediate delivery, immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P8, 3936 Market, Philadelphia 4, Penna.

NEW Notion millions need. Sensational profits. Tyform, 5829 Napoleon, Chicago.

LOOK Here! Wanted—Men and women to start in business on credit. Sell some 200 farm-home products. Thousands our dealers now make quick sales, big profits. For particulars write Rawleigh's, Dept. H-192-PPM, Freeport, Ill.

AMAZING Ketchup dispenser! Pumps ketchup out of bottle. Sells fast to housewives, restaurants, stores. King, 55-P Oleander, West Springfield, Mass.

BLIND Workers need your support. Make more money taking orders for floor brushes, rugs, towels, many other items made by the blind people and also help create work for them. Free catalogue. Pacific Blind Products, 1024-M Santee, Los Angeles 15, Calif.

NEW Sensational money maker. "2-in-1" scissors and knife sharpener. Nothing like it before. Proven success. 100% profit. 30 second demonstration gets order. Special trial offer. Barberdier, 918 Eleventh, Sacramento, Calif.

HOTTEST 39c item on the market. Write National Sales & Service, Greenville, Penna.

SELL Big profit 3x5 1/2 inch stock signs. Write for jobbers introductory offer. Al Hawkins Sign Co., Sioux City 7, Iowa.

FREE Samples. Big profits showing amazing Glow-in-the-Dark specialties. House numbers, pictures, plastic novelties, religious and nursery objects, etc. Large manufacturer. Madison Plastics, 303 Fourth Ave., New York 10, N. Y.

BE First! Clean up selling brilliant new, metal Christmas cards featured in America's greatest box assortment line. Special metal, plastic, foil and novelty assortments. Five portfolios of personal cards. Fast imprint service. Free samples. Elmcraft Chicago, 5930 South Western, Chicago 36, Ill.

BOYS! Earn big money easy, spare time, selling brass name plates for neighbor's doors. Write Hubstamp, 359-C Congress, Boston, Mass.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 5103, Cincinnati 3, Ohio.

BE Renewal headquarters for all magazines. Handle everything at home. Big profits. No experience. No capital needed. Free catalog tells how. Write McGregor Magazine Agency, Dept. 129, Mount Morris, Ill.

LOOK! Make money all year round selling personal initialed individualized belts, buckles, cap badges, western buckles, tie holders, name plates. 2000 emblems to choose. Big profits, whole or part time. Please write today special outfit offer. Hook-Fast Specialties, Box 1425, Dept. 6, Providence, R. I. Established 1926.

SEWING Machine electrification kit. Nationally advertised. Has Good House-keeping Guaranty Seal. Can be demonstrated and sold in 5 minutes. Make at least \$5 per sale. For complete details write today to Brownell Distributors, Inc., Dept. PM, 308 Canal St., New York 13, N. Y.

FREE Water and our concentrates, make flavors, lotions, shampoos, 125 products, labels, bottles supplied. Qualco, E29030 Russell, Detroit.

MEXICAN Feather pictures. Unusual novelty. \$1.00 (stamps) brings \$2.00 worth samples, details. Refunded if unsatisfied. Aztec Art-P, Apartado 782, Mexico City.

MAGIC Cleaner—Laundry soap deal. Hotter than a firecracker. Big profits. Sample free. Bestco, 4642 No. Central, Chicago.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-tobs, name plates. Hart Mfg. Co., 363 Degraw St., Brooklyn, N. Y.

PHOTO-Salesmen-agents. Sell beautiful hand-colored plastic enlargements. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

GOLD Lacquered window sign letters. Large sizes penny each. New foils. Absolutely beautiful. Free samples. Atlas, 544 W. 79th, Chicago 20.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

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HIGH-GRADE SALESMEN

SALESMAN! Make over \$30.00 a day! Sell nationally advertised adding machine for only \$12.95 complete. A desk model portable, precision built, fully guaranteed, every inch a business machine. Easy to operate, easy to sell, easy for you to make big money at 49% profit! For life-size color photo and full details, write today to Lightning Adding Machine Co., Inc., Dept. ZD-9, 543 So. Spring Street, Los Angeles 13, California.

PATENTED Screw-holding screw drivers! Remove, insert screws difficult places; fast sales stores, factories, mechanics; low prices. Toolco, 301 Wentworth Bldg., Boston, Mass.

SALESMEN—Sideline. Earn \$3,000 next 5 months selling calendars, advertising specialties. Buyers everywhere. Big commission. Samples free. Continental Calendar, 542-A South Dearborn, Chicago.

15 COLOR Sport shirts. Cuban jackets. Terrific commissions, free outfit. Nylons, house dresses. Jarod Manufacturing, Rockville Centre 71, New York.

SELL Ultra-blue stock signs to stores. 1000 slogans, comedy, general, religious. "7x11" cost 6c, sells 35c. Make money. 15 samples ultra-blue signs "7x11" \$1.00 postpaid. Lowy, 8 West Broadway, Dept. 482, New York City 70.

MARINE And hardware salesmen. Fast moving, non-conflicting, sideline. Packaged in cellophane. Free sample. Wilson Products Company, 740 E. 106th St., Chicago 28, Ill.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-89, 7530 Greenwood, Chicago.

UP TO \$50.00 in a week and tailored suit for yourself without paying one cent. Write for plan Progress Tailoring Co., Dept. V-217, Congress and Throop, Chicago 7, Ill.

MAKE \$100.00 A week selling subscriptions for "Jr." The magazine for boys and girls. Every parent a prospect. See the possibilities? Write Dept. B-4, "Jr." Magazine, 812 North Dearborn, Chicago 10, Illinois.

DEMONSTRATE. Sell to taverns, amazing, original glass rinse "Clear Glass." No water spots guaranteed, no towelings. Sell thru jobbers, override, all you can sell free, less jobber commission. Riesen Chemical, 419 Vliet Street, Milwaukee 12.

FIRE—The big "Chief" automatic plus highest profits is the reason fire control men are writing to Red Ball, Inc., Box 1552, Salt Lake City, Utah.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

STOP! Want to make money all year round selling a complete line, wool uniforms, shirts, caps, ties, badges, 2000 emblems, personal initialed buckles, belts, and hundreds of other easy-to-sell items? Sales kit furnished. Please write today. Hook-Fast Company, Box 480PM, Roanoke, Va.

BIG Money taking orders. Shirts, ties, Sox, pants, jackets, sweaters, shoes, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-AN Lincoln, Chicago.

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3800 LATEST Used correspondence courses. Catalog 30c. EG, Elmsford, N. Y.

CAN A man my age become a hotel executive even though he has no previous hotel experience? Would you like to step into a well-paid position as hotel or club manager, purchasing agent, social director or assistant manager, etc.? The success of Lewis graduates from 18 to 50 proves you can—though you never had a minute's experience in hotel work. C. P. Hearne says: "Shortly after receiving my diploma from the Lewis School, I gave up my job in a power plant and accepted a position obtained for me by the Lewis Placement Bureau as Assistant to the Manager of a famous country club. Now manager and have had three raises in salary." Our free book, "Your Big Opportunity," explains how you can qualify for a well-paid position in leisure time, how you are registered free of extra cost in Lewis National Placement Service; shows how you can be a Lewis Certified Employee—certified to "make good" when placed. Write for it today. Course approved for veterans' training. Lewis Hotel Training School, Desk PM-324, Washington 7, D. C.

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I WANT New writers to cash checks of \$1 to \$100 offered daily. The easiest way to write for pay. No previous experience necessary. Free details, Saunders M. Cummings, 468-11 Independence Bldg., Colorado Springs, Colo.

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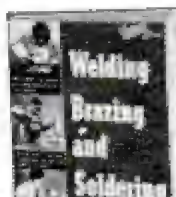
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14 1/2" x 5, 6 ply 1 1/2"	\$10.95

New airplane tires, tubes and wheels with high speed Timken Hyatt ball bearings. Stock #544, 800 x 5-6 ply 1 1/2". \$14.50
1700 x 20" 12 ply TUBES. Stock #545. \$44.50
for earthmovers, trucks, \$300 value.

56" 16 ply Bomber TIRES and TUBES only \$600 value, for tractors, etc. Stock #546. Our price. \$59.50

AIRPLANE TIRES with landing gear hydraulic strut. Firestone & Goodyear standard tires, 8 ply 2 1/2" 29" high. Hydraulic strut is 4 1/2" long, 3 1/2" dia. Can be made into heavy duty trailer. Stock #531. \$22.50 each.

PRICE \$22.50 each.

BRIGGS-STRATTON

GAS ENGINES

SAVE \$25 ON LIST PRICE. All are NEW in original crate. Hope start, 1700 RPM all brand new and guaranteed. 1 1/2 to 2 1/2 HP Model AP 1 list price \$102.10. Stock #307. Our price \$77.00
3 1/2 HP Model BP. List price \$111.50. Stock #308. Our price \$86.00
5 to 7 HP Model ZXP. List price \$137.00. Stock #309. Our price \$102.00



CHIMES OR CALL SYSTEM

Navy type. Good for schools, hospitals, office, homes, etc. 110 Volt AC or DC. Weather proof. LIST PRICE \$15.00. Stock #552. Super value at only. \$1.95

A REAL BUY

BULL BUFFER

Fits any 1/4" drill. Polishes, sands & grinds. Sheepskin, 4 3/4" rubber disc. COMPLETE. Stock #553. \$1.95
Imagine it's only. \$1.95
Extra sanding discs \$1.20 a Doz.

HALES FIRE PUMP



For fire depts., factories, forest fire prevention, etc. 600 gal. per min. Can be operated with a four or six cylinder gas engine. 4 1/2" intake, 2-2" outlets, 265' head at 120 lbs. pressure. Passed by national board of fire underwriters. NEW. \$149.50
Stock #407. Price. \$149.50

BALL BEARING ARBORS



Grinding and saw arbor, has 1/2" double end shaft, 1 1/4" long with 2" center pulley. New departure double roll ball bearings. Right and left hand thread. Self aligning Dodge pillow block. 10,000 RPM. Bearings alone list at \$10. Complete arbor new. \$4.95
Stock #305. \$4.95
HI-SPEED GRINDER (not pictured) has 2 step pulley driven thru rear or base \$10.95
Stock #328. \$10.95

PLASTIC TUBING

Good for water, oil, air, electrical installations & radio work. Available in 100 ft. lengths. Min. order 50'.
1/4" 3/16" 1/2" 7/16" 4c
per ft. 2c per ft. 1c 3 ft. lengths
5/16" 3/8" 1/2" 3/4" 6c
per ft. 3c per ft. 1 1/2" 8c
per ft. 1 3/4"

★ HALF TON WAGON



Half ton wagon with plate aluminum body 24" x 42", 3/8" steel axle. Stock #332. Write for details.

SWIMMING OR BATHING POOL



Made of heavy glass cloth with rubber impregnated on both sides. 12' diameter, 5' high, 3000 gal. cap. Ideal for small irrigation project, swimming pool, animal watering. Complete with cover & guide lines. Gov. price approx. \$350. Our price. \$69.50
True to handling cost full amount.

WESTINGHOUSE

3 phase motors. All models 1/2 HP to 1 1/2 HP. 220 volts. Motors totally enclosed-ball bearing. Stock #541. 40% off list prices.

AIR COMPRESSORS

All ratings from 1/2 HP to 10 HP—new and rebuilt. Write for free details.

GENERATORS

300 watt, 12 volt DC, 2000 RPM. Heavy duty with current cut out relay. High and low switch. 30 amp. meter. Can be bought less shaft and base to be used directly mounted to a Briggs & Stratton 1 HP engine. Stock #323. NEW only. \$7.00
Complete with shaft base and bearing. Stock #324. \$15.95
300 watt, 110-220 volt AC, generator. Mfg. by Electric Specialties Co. Weighs 20 lbs. Stock #416. NEW only. \$34.50
1000 watt, 110 volt AC, 60 cycle generator with built in radio filter. Leland ball bearing 1800 RPM. Stock #526. \$89.50
1800 watt. Same as above. \$99.50
Stock #527. \$99.50
2500 to 3000 watt, Leland generator 110 volt 60 cycle. Self excitor, radio filter, junction box for plug in. Stock #525. \$145.00
NEW. \$145.00
3000 watt, Delec, 110 volt DC. Plug in, ball bearing 2800 RPM. List price \$343.00. Used but like new. \$99.50
Stock #321. \$99.50

HEAVY DUTY ELECTRIC CABLE

3 wire #10 Super cable. Stock #351. 65' with 100's. Value \$28.00. \$13.00
Our price. \$13.00
3 wire #10 government submarine type. Use underground, underwater, overhead. Cost U. S. 00c ft. Stock #542.

OUR PRICE
100 ft. \$24.00 500 ft. \$100.00
250 ft. \$55.00 2500 ft. reel \$530.00
2 conductor rubber cable #4—stranded—75 ft. length with connectors. Stock #543. List price \$177.00. \$90.00
Our price. \$90.00
4 wire #6 stranded heavy duty. List price \$2.36 per ft. Stock #547.

OUR PRICE
50 ft. \$30.00
100 ft. \$55.00
250 ft. \$125.00
500 ft. \$225.00
1000 ft. reel. \$400.00
3 wire 10" rubber cable, two male connectors. Value \$109.50. \$35.00
Stock #554. Price. \$35.00

WESTINGHOUSE Transformers

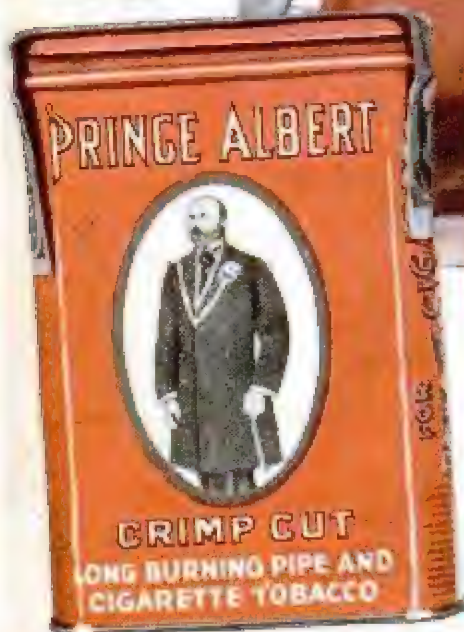
Dry type—insulated—440 volt, 220 volt to 110 volt—single phase.
75 K.V.A. List price \$1009.00 Our price \$504.00
37 1/2 K.V.A. List price \$ 717.00 Our price \$358.00
20 K.V.A. List price \$ 626.00 Our price \$310.00
25 K.V.A. List price \$ 558.00 Our price \$279.00
20 K.V.A. List price \$ 460.00 Our price \$230.00
All like new and guaranteed.

ALL ITEMS GUARANTEED C & H ELECTRIC Co.
AS REPRESENTED
434 W. JUNEAU AVE.
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New HUMIDOR TOP
— locks out air —
locks in freshness
and flavor



● Of course he'll be popular with the ladies! He has Pipe Appeal, the ultra-masculine charm of the pipe-smoking man! And with Prince Albert tobacco in his pipe, he's headed for smoking joy and comfort. P. A. is rich-tasting, mild, and easy on the tongue!

P.A. means Pipe Appeal*
P.A. means Prince Albert*

**The
National
Joy Smoke**

Did you know that Prince Albert is choice crimp cut tobacco that's *specially treated to insure against tongue bite?* That's right! And that's just *one* reason why more men smoke Prince Albert than any other tobacco! Try P. A. today!

"NO WONDER P.A. IS SO
POPULAR FOR CIGARETTE
'MAKIN'S'! ROLLS UP FAST
... TASTES GRAND"



B. J. Reynolds Tob. Co., Winston-Salem, N. C.

Lynn A. Williams, Jr., Vice-President of the University of Chicago, points out that there is more to the atom than war and destruction



POPULAR MECHANICS

AUGUST
1949

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 92 NO. 5

How the atom is working for you

By Lynn A. Williams, Jr.,
Vice-President of the University of Chicago

IN 1887 an American scientist was engaged in a very strange and useless pursuit. He was measuring the speed of light. His name was Albert Michelson. If anyone had asked him what use his researches would have, he would have said, "None." It wasn't necessary to know the speed of light to drive a carriage or light a candle. The knowledge Michelson sought could not be put in a box and sold for a profit. But his work had some surprising consequences.

You all know that he found that light travels 186,000 miles a second. This was not surprising in itself. But he found that all light seemed to travel at the same speed.

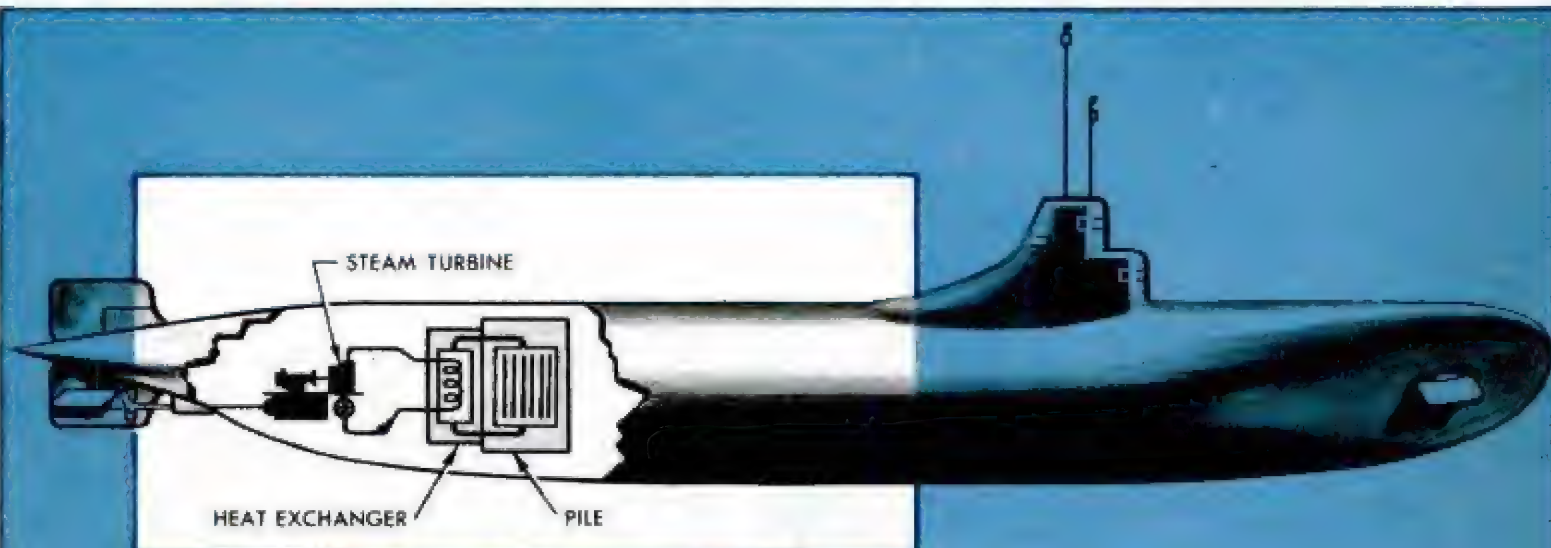
Now if you are in a car traveling 50 miles

an hour against a 20-mile wind, you will feel a 70-mile wind on your face. If you go 50 miles per hour with a 20-mile-per-hour wind, you will feel a 30-mile-per-hour wind on your face.

So you would suppose that if you were moving toward a light source (as the earth moves toward a star or as it revolves toward the sun and away from it on the other side) then you would expect to find that the light speed would be measured at 186,000 miles per second plus the speed at which you moved toward the light. If you went away from the light, you would expect its measured speed to be less.

Michelson and Morley found this not to

Artist's conception of an atom-powered submarine which could remain submerged indefinitely if necessary





Top, radioactive algae, grown in these jars at Argonne National Laboratory, are fed to animals in research on food

Above, radioactive carbon dioxide is forced into sealed jar where lettuce thrives in the radioactive atmosphere

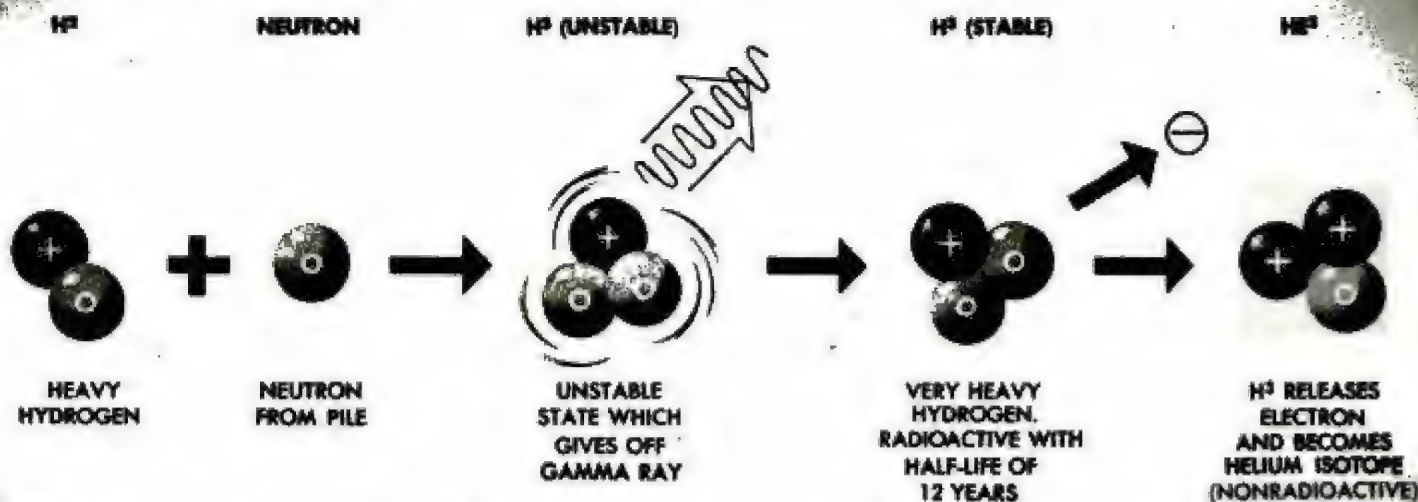
Right, Chicago scientist puts specimen of digitoxin made from radioactive fox-glove plant in slide of Geiger counter

be true. All light, no matter what its source, has the same speed. How could this be?

In Germany in 1905, Albert Einstein proposed an answer. The speed of light does change, he said, but as matter moves in space it lengthens or shortens relative to its motion. And time also changes relative to motion. In developing the formulae to express the theory of relativity, Einstein noticed that one factor, Mc^2 , kept cropping up. He explained this factor in a dramatic flash of genius and insight. This factor, Mc^2 , he said, was the energy inherent in matter. Thus the famous formula, $E=Mc^2$ was born. "E" is energy, "M" is mass or weight and "c" is the speed of light. Einstein said that the energy of matter was stupendous because c^2 is such a tremendous number: $186,000 \times 186,000$.

On December 2, 1942, a group of scientists gathered





Drawing shows how an isotope is made radioactive and how its radioactivity stops with release of electron

at the University of Chicago and initiated uranium chain reaction which transforms matter into energy. They had calculated the output of energy from Einstein's equation and the enormous value which was predicted spurred them on to their goal. They opened the way to the greatest military weapon of all time. They created the greatest economic fact of our era. They opened new and endless vistas of scientific inquiry and knowledge.

Of course, many ideas intervened between Michelson and Einstein and Fermi and the "pile" in 1942. For nuclear energy was no accidental discovery. Science does not proceed by aimless experiment and observation leading to a theory. The theory comes first, the experiment follows. The pile under the grandstand at the University of Chicago, where the first self-sustaining chain reaction was achieved, was constructed with the greatest of care according to

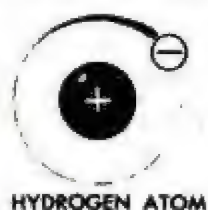
precise calculations by nuclear scientists.

Before atomic research could even be considered, a number of ideas had to exist. The idea that there is an atom had to be established. Although the ancients, Lucretius, for example, postulated that

matter might be composed of tiny particles, it was not really until this century that the evidence began to pile up sufficiently to permit the formulation of a theory which includes the atom as a basic building block of everything—the chair you are sitting on, the air you breathe and even your own body.

Then it was necessary to get the idea that the atom itself had an internal structure. Obviously, there could be no splitting of atoms unless the atom was composed of parts which could be split. Also, there is Einstein's important idea that energy and matter are different forms of the same thing.

The formula, $E=Mc^2$, means that energy and matter can be



HYDROGEN ATOM

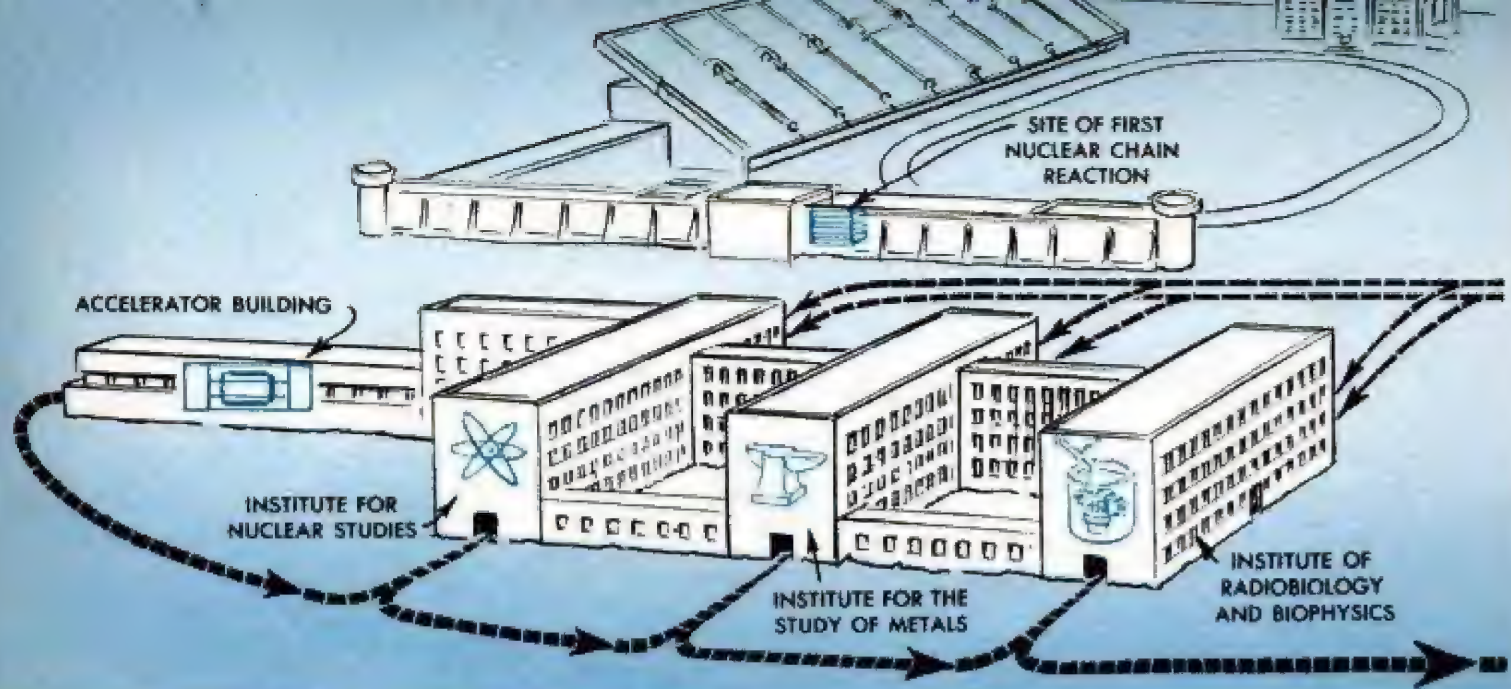


HEAVY HYDROGEN ATOM

Ordinary hydrogen atom has one proton and electron. Add neutron and it changes to heavy hydrogen

When four hydrogen atoms combine into a helium atom in the sun, there is a loss of mass, called mass defect





At the University of Chicago, the atom is a great research tool. Dotted lines show importance of free exchange of ideas among various branches of science



Ancient wood, above, is placed in center tube of a supersensitive Geiger counter, below, to have its age determined by measuring residual radioactivity



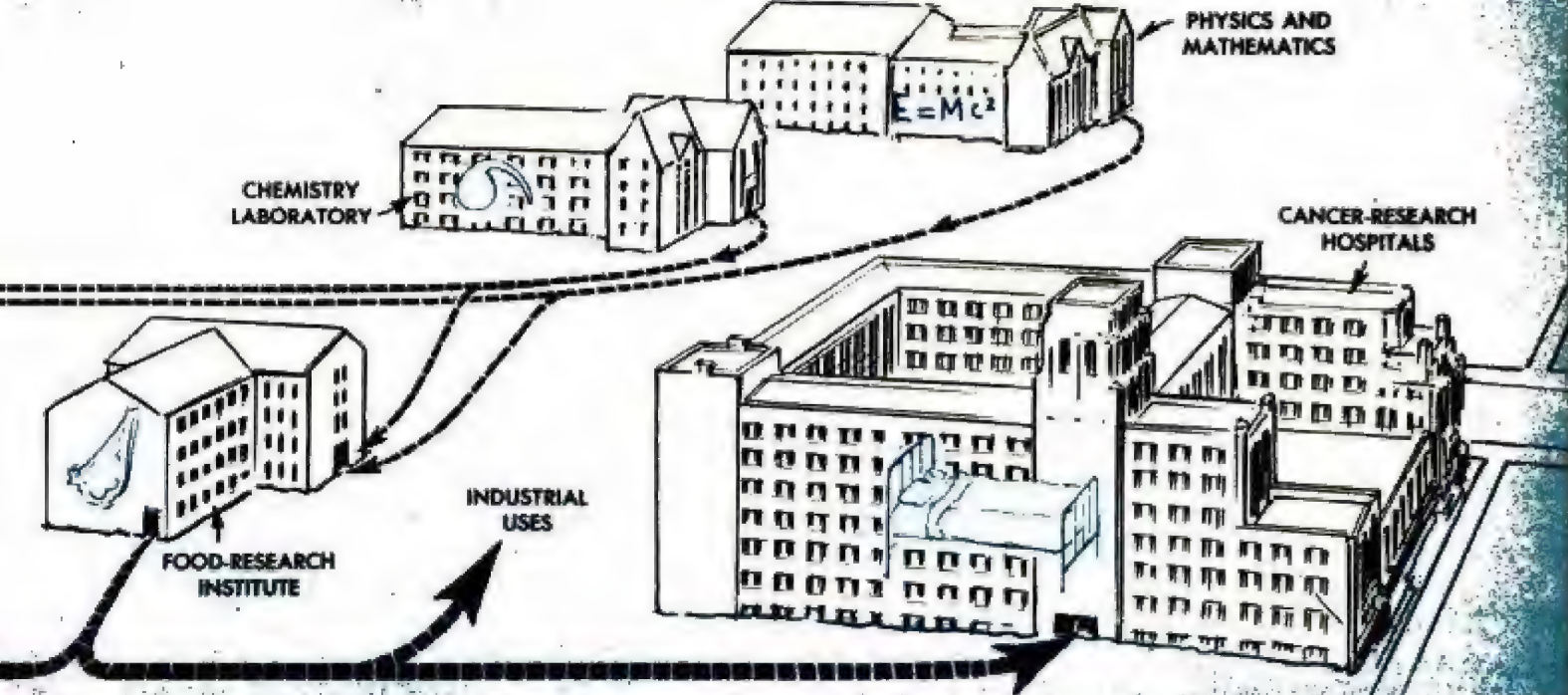
equated, and that the energy existent in matter is tremendous. If we were able to get from matter all of the energy which is in it, we could get from two pounds of matter 25 billion kilowatt hours—enough energy to supply all the power needs in this country for two months. Twelve pounds of matter, therefore, would last this country for a whole year. This, of course, is theoretical only. We don't yet know how to get this much energy out of matter. In fact, in the atom bombs which were dropped on Japan, we got only about $\frac{1}{10}$ of one percent of the potential. This would mean that instead of 12 pounds, we would need 12,000 pounds or 6 tons, an amount you could easily store in your basement.

Now I should like to discuss some of the particles which make up the atom. Let us start with the simplest atom, hydrogen. The hydrogen atom is thought to be composed of a nucleus of a very dense or heavy proton which has one positive charge and an electron having almost no weight but having one negative charge.

There is one other very important particle to be considered: the neutron. Like the proton, it has great mass, but does not have any electric charge.

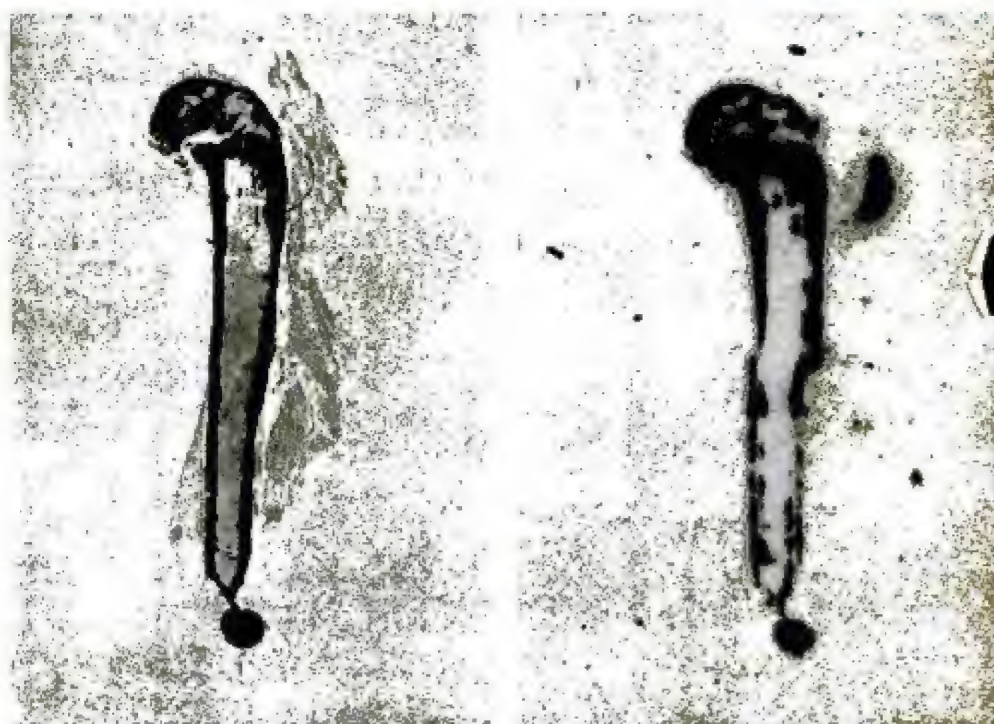
The nucleus of every element except ordinary hydrogen is made up of protons and neutrons. It is possible, for example, to have heavy hydrogen which is like ordinary hydrogen, except that in addition to the one proton in the nucleus there may be also a neutron, thus making this hydrogen twice as heavy as ordinary hydrogen.

Helium consists, in its nucleus, of two protons and two neutrons so that its mass is four times that of ordinary hydrogen. One kind of atomic energy exists in the sun through a cycle in which hydrogen atoms eventually are combined to form helium. When this happens, there is somewhat less

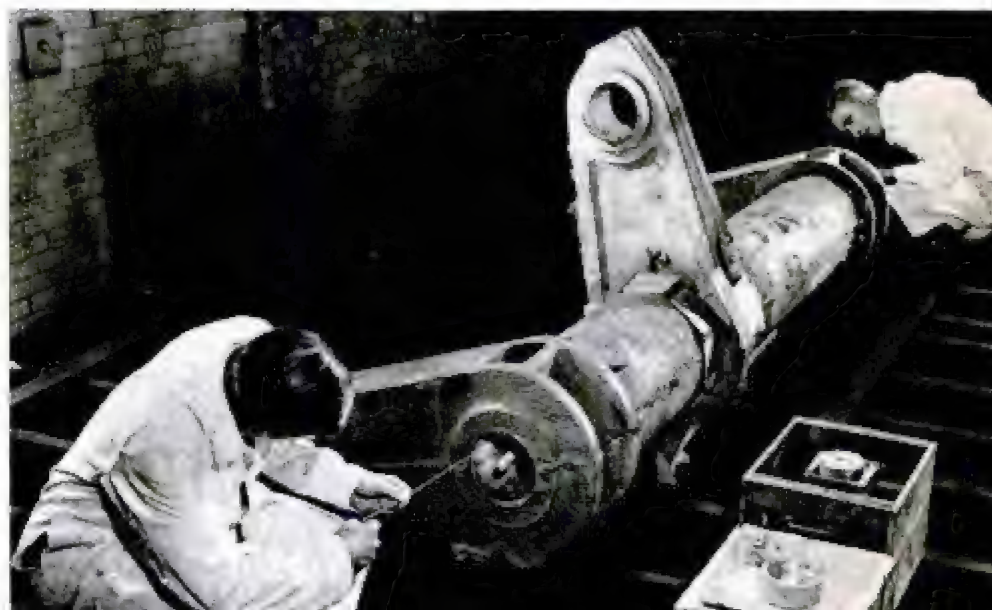


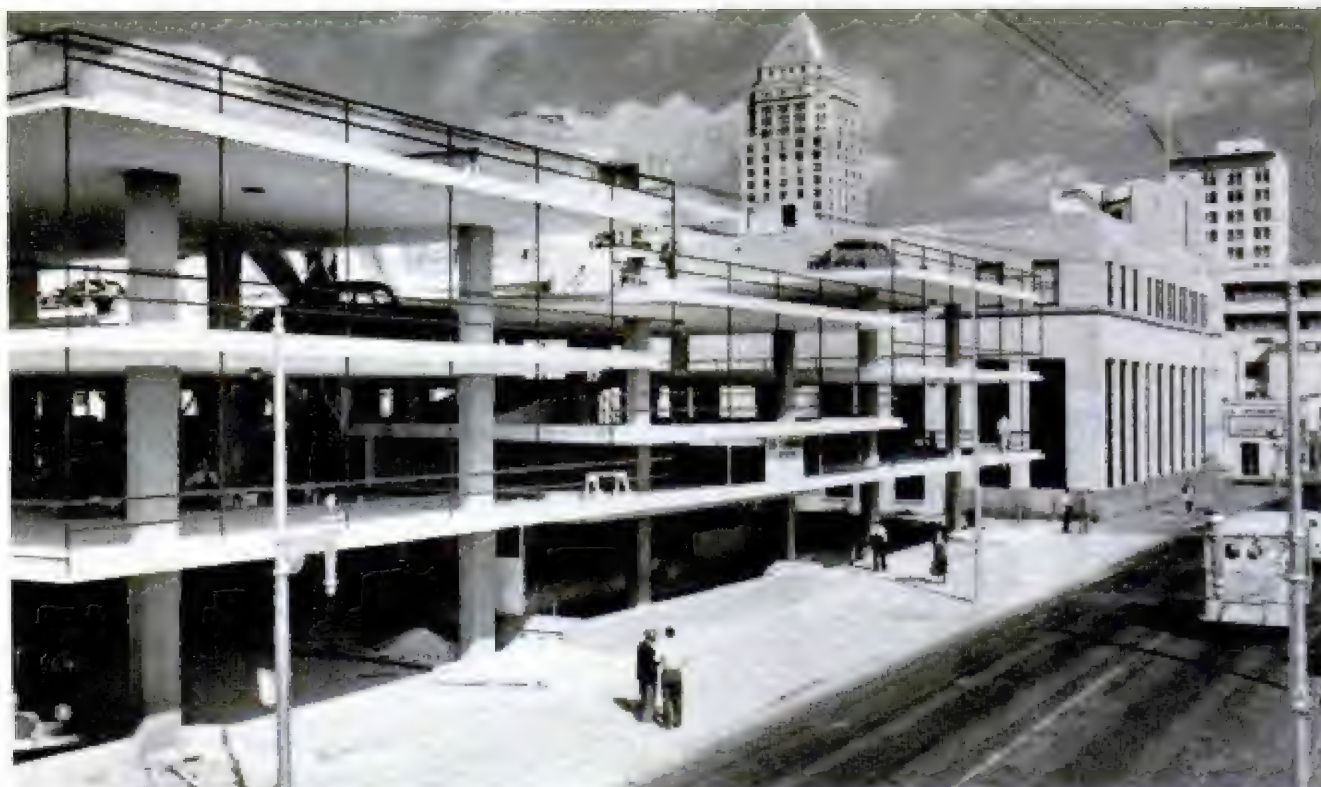
mass in the helium than there was in everything which went into it and this loss of mass has had to come out as energy. It is this which is thought to account for the energy from the sun. The man-made atomic energy, thus far, does not come from these very simple elements like hydrogen, but it comes rather from the very complex elements like uranium. Uranium, instead of having a mass of about one, has a mass of 238. It is composed of 92 protons and 146 neutrons. But this form or isotope of uranium is too stable to be the source of a chain reaction. There is, however, another form or isotope of uranium, called U-235 (92 protons and 143 neutrons), which occurs in the ratio of about one part in 140 in ordinary uranium and is the basic element in atomic energy as now conceived. If the nucleus of U-235 is hit by a neutron, it breaks apart into other elements, barium, krypton, strontium and xenon and, in the course of doing this, releases energy. In the course of releasing energy, it releases a number of free neutrons. These neutrons can, under proper circumstances, hit the nucleus of another uranium atom which will split and produce more neutrons. It is this which is called the chain reaction.

This is the kind of reaction
(Continued to page 242)



Above, right, radioautograph of chicken bone was made by rays from radioactive strontium injected in the bird to learn where it goes in the bone structure. At left is an ordinary photograph of the same bone section. Below, film, taped to casting, will pick up rays from the isotope being pulled inside, thus detecting any flaws in metal





Concrete Building Without Walls Holds 360 Cars

Tourists might think one of Miami's new buildings is unfinished. Actually, it's a building without walls. Made of poured

reinforced concrete, the structure is used as a parking garage. Its three "decks" hold a total of 360 automobiles.



Economy Automobile Uses Standard Parts

Constructed of nationally known standard parts, a new small car, being produced in California, will sell for less than \$1200. It has a 63-horsepower engine and will go 80 miles an hour. It's economical to operate, getting 30 miles to the gallon. Because it is assembled with standard automobile parts, the car can be serviced any place in the country.

Phosphorescent Material "Previews" Photo Prints

Photo hobbyists can "preview" prints without using paper or chemicals by exposing their negatives against a phosphorescent material. The negative is slipped between a sheet of the material and a yellow filter. After a three-second exposure to a photoflood bulb, the phosphorescent material provides a clear positive image that lasts for about one minute, enabling the photographer to see how a print made from the negative would look. The viewer has to be used in a dark room.





Low-Slung Spanish Train Is "Zippered" Together

Built in the United States for a Spanish railroad, a new streamlined passenger train is so low that people standing on the station platform have to look down at seated passengers. Because of its all-aluminum construction, the train is almost 75 percent lighter than a conventional streamliner. Each coach of the train is actually five articulated units, their joints closed by zippered rubber diaphragms. One of the five units of each coach houses the equipment that would be mounted beneath the floor of a conventional coach. Each unit has only one pair of wheels and the front portion of the unit is supported by the wheels of the preceding section. Designed by Spanish engineers, the train will go into



service between Madrid and the French border, a distance of about 500 miles. Expected to reduce present running times, the train has a cruising speed of 120 miles an hour on straightaways and will take curves at 80 miles an hour.

Quick-Change License Holder

You can change plates on your car without tools if you have a license-plate holder and frame combination that holds the plate securely by spring action. The base of the holder is bolted permanently to the bracket on the car. Then the plate, framed by four interlocking metal pieces, is slipped into a top groove and pushed upward, stretching two strong springs that are part of the base. The lower edge of the plate then slips into another groove in the bottom of the base where it is held securely by the downward pull of the springs.



•Listen to the fax

NEWSPAPERS have broadened their services until the printed page does just about everything except speak aloud to the reader. Now a new kind of newspaper is doing exactly that. It's a newspaper that talks to the reader as he scans the headlines.

The University of Missouri's School of Journalism is the scene of intense experimental work to develop audio-facsimile, whereby a page of news and pictures is reproduced by radio while a commentator discusses the information.

Since October, 1948, Missouri FAX, one of two daily facsimile newspapers now in operation, has produced a unique audio-visual printed page. Facsimile equipment for the experiment is provided by the St. Louis Star-Times and radio station KXOK.

Audio-fax, as the system is called, is made possible by a development called multiplexing, which allows broadcasting of sound and facsimile over a single FM radio channel. Because Columbia, Mo., has no FM station, FAX uses direct wire rather than radio transmission, but operates exactly as it would over the air waves.

The facsimile laboratory now is experimenting with 15-minute, four-page audio-

fax broadcasts. Here's the way it works:

An audio newsman and a photographer are sent to the scene of any news event. The newsman prepares an on-the-spot tape recording while pictures are being taken.

At the laboratory the pictures are developed immediately and worked into a page layout. Meanwhile other staff members prepare news stories and headlines for the visual page and blend the tape recordings into a smooth commentary.

Special advertisements are designed for this type of newspaper. As the ad appears on the viewer, the announcer points up the printed message by drawing attention to the pictures.

Although facsimile has been under development for years, the synchronization of a radio voice with the printed page is new. Authorities at Missouri's School of Journalism, who are deep into facsimile by now, say that mass production could bring the price of AM-FM-Fax sets down to about \$100 or \$150. However, only those persons within the range of a facsimile broadcasting station could use the sets.

Missouri FAX now pipes the printed page and commentary to five receivers in campus buildings, a bank and a theater.

Staff member starts the drum on the transmitter rolling while the announcer stands by to start his commentary
University of Missouri photos



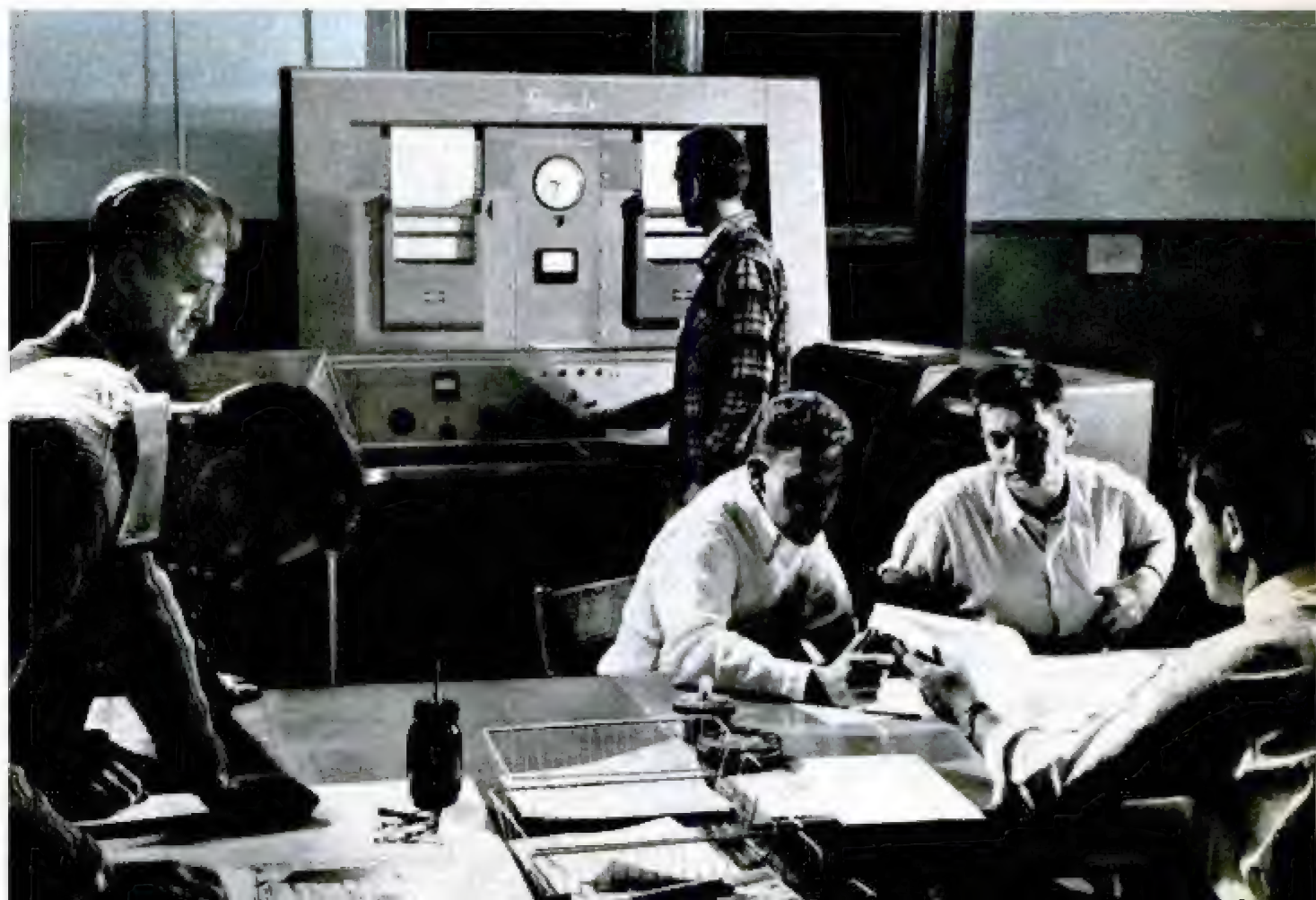
After the page has been prepared for transmission, it is wrapped around a cylindrical whirling drum and an electric eye scans it from top to bottom. Shades of black and gray in the original copy provide the varying signals that go out to the receivers. There these signals are converted back to a printed page by an electrolytic printing process. Particles of iron are transferred from a printer blade to a chemically treated sheet of paper. The particles combine with the chemicals to produce black and gray patterns that are identical with the original page. The paper, which is moist, is dried by a heating bar as it comes from the receiver. Only about 3½ minutes pass between the time the page is placed on the drum and the time the facsimile page rolls from the receiver.

Audio-facsimile is expected to make possible many new uses for radio. Music and foreign language lessons can be conducted by voice while printed examples appear before the student. Housewives listening to cooking-school programs would hear oral instructions and have a permanent printed record. Police could speed the pursuit of criminals by sending fingerprints by facsimile while describing the criminal by voice.



Prepared copy, headlines and photos are pasted to a backing sheet. Finishing touches are added to the page with black ink

Student FAX staff members edit and rewrite stories and make the broadcasts. The paper is unique because it speaks aloud to the reader, combining a facsimile page with a commentary





American Helicopter Co. photos

Lightweight, compact jet-engine system of the Top Sergeant, above, permits added space for cargo and passenger. Right, fuel is pumped through rotary seal and carried to rotor-tip engines by flexible lines

Jets on Tips of Rotor Blades Fly Top Sergeant 75 M.P.H.

One or both pulsejet engines on the rotor-blade tips can safely operate a new helicopter known as the XA-5 Top Sergeant. The first helicopter specifically designed for pulsejets, it is built to carry a pilot and observer 140 miles at a top speed of 75 miles an hour. After compressed air starts one engine, the rotor starts whirling and air ramming into its intake starts the second engine. The only moving part of the power plant is a reed valve system that takes only five minutes to replace. The entire helicopter can be assembled in 30 minutes.



Hydraulic Truck Loader

One man can load a truck in 10 minutes with a hydraulic loader operated from a platform atop the cab. From this platform, the operator can drive the truck as well as operate the loading apparatus. The loader has a variety of uses: It scoops loose material into the truck from the ground; it serves as a lift for raising heavy crates; and the scoop pivots for use as a loading cup, such as used on garbage-collection trucks. The loader can lift 2000 pounds.



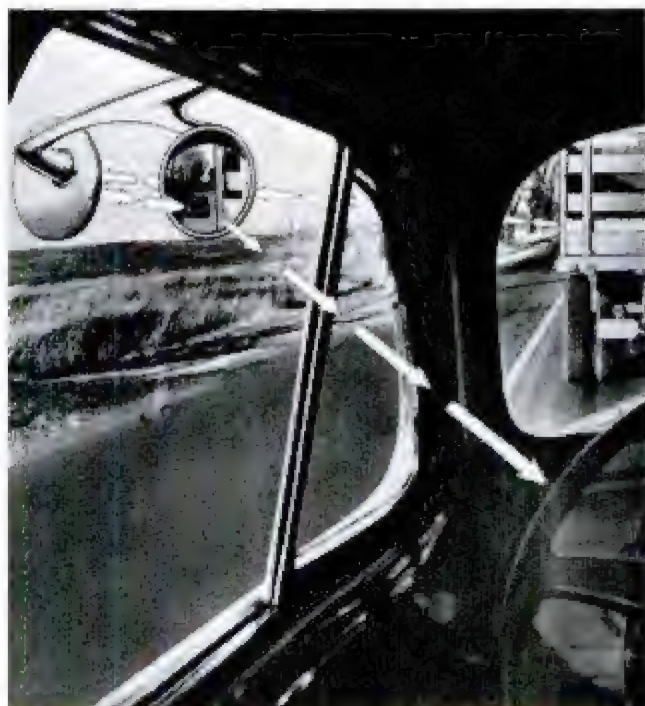


Power Keyhole Saw

With an electric keyhole saw that uses a saber-toothed blade, you don't have to drill a starting hole to cut out an opening in the center of a board. The blade has a special point that cuts directly through material up to one inch thick. It also cuts around a $\frac{1}{4}$ -inch radius. The fractional-horsepower motor delivers 3250 cutting strokes a minute. A stand is available for mounting the saw upside down on a workbench, converting it into a table saw.

Front-Vision Mirror

Driving an automobile is made safer by a front-vision mirror device that enables the driver to "see around" a car or truck in front of him before he swings out to overtake it. Consisting of two mirrors, mounted so that the image is reflected back toward the driver, the device clamps on top of the door. By watching the reflected image in the mirror facing him, the driver can see approaching vehicles without swinging out of his traffic lane.



Bad-Weather Football

More than 100 grooves along its length make a new bad-weather football easier to handle in rain, sleet, snow and extreme cold. It was designed by a leading sporting goods company in keeping with official size and weight requirements to make ball handling and passing easier and to minimize fumbles.

Flint-Type Lighter for Lanterns

Gasoline lanterns can be lighted even in a high wind or hard rain if they are equipped with a new flint-type lighter. Fastened directly to the bottom of the lantern, the lighter throws up sparks to light the mantle or wick. The lighter fits all models of gasoline lanterns, lamps, stoves and heaters.



High School Assignment:

Homework for the high-school boys at Chester, Ill., is house-building. They earn their diplomas, their classwork helps solve housing shortage



Above, roofing goes on fast with a half-dozen hammers pounding. Here, the high-school students nail down the shingles on the breezeway roof. Below, as the crew puts up siding, a helper cuts the shingles to size



By Dorothy O. Moore

BOYS SCRAMBLED
Over the rafters, dangled from scaffolds and dashed busily about a ranch house being built in a new subdivision of a midwestern American town. They were there to earn high-school diplomas and were building the house without experienced help other than that of their instructor.

Chester, Ill., is a town where most of the wage earners are craftsmen. It has a flour mill, a shoe factory and a building boom. Because building trades appeal most to boys of the community, Chester was chosen two years ago as one of the spots where educators would experiment with a new approach to "shop" education.

Seventeen top-ranking high-school students, ages 16 to 18, were selected from a long list. They passed an aptitude test and qualified for the experimental class by working 100 spare-time hours at a building trade. There

POPULAR MECHANICS

build a house



This neat home was built by the Class of 1948 and sold to the highest bidder at the end of the school year

was a wave of amateur home repair work in the southern Illinois town during the next summer vacation. Boys who had never used a razor picked up planes and deftly smoothed doors that stuck, cleaned refuse from sink goosenecks, repaired faulty toggle switches and converted attics to pine-paneled playrooms.

Money to finance the class project of building a family-size residence was borrowed by the school board from local banks. Tools, materials and a plot of ground were purchased. Chester's first boy-built house was in the making.

In September 1947, Maurice McElhiney, vocational building trades instructor of Chester High School, started the term by handing his class of 17 a "home" work assignment: five rooms with bath, garage and utility room. In the classroom, the kids drew plans and specifications. Then they hiked or hitch-hiked to the home site, took shovels and dug the excavation for footings.

The house grew in spite of football practice, Christmas and Easter holidays and an epidemic of

romances. There was some trouble with plaster but finally the finish coat was smooth. The furnace and plumbing functioned perfectly, light switches worked like Aladdin's lamp. By the end of the term in June 1948, the house was ready for some house-hungry family.

The kids rolled the lawn to smoothness, planted evergreens, packed up their tools and held out their hands for diplomas. Educators beamed, for the house the kids built was as solid as any in the block. The Class

Big enough to cover an entire wall without unsightly seams, this wall-board had to be bowed and tied before it would pass through the doorway





Above, two of the high-school home builders set the first ceiling square in the bedroom. Below, the boys' instructor, Maurice McElhiney, demonstrates the way to measure the wallboard sheet to assure an exact fit



of '48 had pounded home lessons never to be forgotten.

There was an "open house" reception on the Sunday after Commencement Day. Prospective buyers thronged through the rooms, over the lawn and gazed down the slope with a view to the Mississippi.

An auctioneer swung into his chant and the visitors topped each other's bids until the trim, white frame house was sold with a profit of \$2000.

The 1949 vocational building trades class began a new term last September with an order for a four-room house, a nest-egg of \$2000 and the conviction that there's nothing like building a lesson from the ground up. Bankers agreed and lent more money.

This term's house was slightly different from the first. It was smaller, there was a breezeway to catch the zephyrs from the Mississippi and walls were not of plaster.

On a 60 by 120-foot lot which they selected, three blocks from the first "school" house, the boys dug for footings. Some had argued for a basement, but digging with hand shovels in the Illinois clay is slow work and the house had to be weatherproof before winter. The kids settled for a ground-floor utility room.

When foundation trenches were ready, the class was divided into working groups. Some shoveled sand, gravel and cement for a 2-4-10 mixture and dumped it into the hopper of a concrete mixer. Others turned the mixer by hand until the "fudge" was ready to be poured for footings. Another group set the concrete blocks for the foundation and troweled the mortar between them. It was mixing mortar for mortarboards, but lessons never were more fun.

Floor joists were toe-nailed down, studding erected and the skeleton of the roof took shape. Enthusiastic carpenters sawed pine two-by-fours to meet specifications. They learned that a "bird's mouth" is a notch sawed near the end of each rafter and they learned how to fit the bird's mouth to plate. They sawed "tail cuts" where the rafters project beyond the wall.

Under McElhiney's watchful eye, they centered rafters on 16-inch centers, using a carpenter's square to determine the lengths of the jack rafters. They had to keep bevel and plumb cuts accurate. Over the roof boards went green composition shingles and the project was snugly under roof before winter deadline.

Student plumbers dug a trench for sewage pipe, installed a septic tank and fitted inside plumbing. Electrical wiring was laced along studding and outlet boxes were set into the walls. Exam time found school board and union officials inspecting and approving the work while the kids nailed white asbestos shingles to wall sheathing.



Left, an inside view of the kitchen built by the Class of 1948. Right, installing a heating duct in the attic

The floor plan, carefully worked out by the boys, includes a 15 by 15½-foot living room with fireplace, two bedrooms with ample closets, a kitchen-dinette with a breakfast bar, a wall of built-in cabinets and outlets for all the electrical appliances used by today's homekeeper. The bath is tiled, the utility room houses a forced-air, oil-burning furnace, a shower and stationary laundry tubs. Across the breezeway is the garage, large enough for a family car, the lawn mower and fishing tackle.

No one showed up at a high-school prom last term with plaster in his pompadour. The Class of '49 ordered precut room-size

slabs of building board for interior walls and ceilings. By bending the flexible sheets, the boys were able to take them in through the front door. Not a nailhead or corner joint can be seen on the finished walls.

The kids won their diplomas by completing the ranch house before Commencement Day. Educators who sponsored the idea are predicting a new curriculum for the nation's teenage vocational students. Master craftsman, at first reluctant to approve the plan, admit the youngsters have done a workman's job. The house the kids built is straight as a plumb line. The boys have passed the test of good craftsmanship.

This family is happy in its student-built home. Photograph shows the professional quality of the construction





Camera Checks on a Champ DIVER



Seagoing birds, such as the brown pelican shown here, don't often pose for the camera, especially when diving for food. However, Hugo Schroder, a Florida photographer, happened by with his camera as this pelican put on a display of diving just off a long wharf. He shot this group, the only pelican-diving series he's been able to get in 20 years. He used a Graflex camera for the shots. Exposure: 1/490 at f:8

Top, left, this dive will be no prize winner. Bird is too far over on back as he nears the surface

Left, with a loud whack, the bird hits the water back first. This is his poorest dive of the day

Top, right, this dive is perfect! Legs and wings are elevated to streamline the bird as it falls

Center, right, the end of a perfect dive! Note the small splash. Wings and legs have been extended

Left, pelican brings its powerful wings forward as it comes up from dive. Its legs push it forward

Right, leaving the water, the pelican spreads its broad wings and tail to get into the air quickly





Furnace door opens automatically like a blinking eye when bundle of stainless-steel rod is properly annealed

They Spin Wire by the Mile

By Clifford B. Hicks

SUPPOSE you could zoom around the earth 18 times every 24 hours, unreeling a strand of wire as you made the circuit. You would be laying wire just about as fast as American mills are spooling it up. Every time our globe whirls once around its axis, our mills spin out about 450,000 miles of wire.

Still an infant in this brisk industry is the making of wire from stainless steel.

The baby has begun to walk by himself but can't yet keep up with the older kids. For several years we've had stainless-steel wire, but not in the quantity we can use; and even the top wire engineers aren't yet sure they have found the fastest way to turn out this shining yarn.

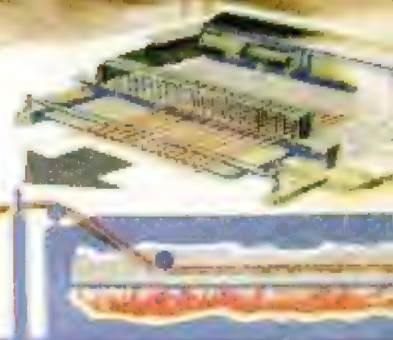
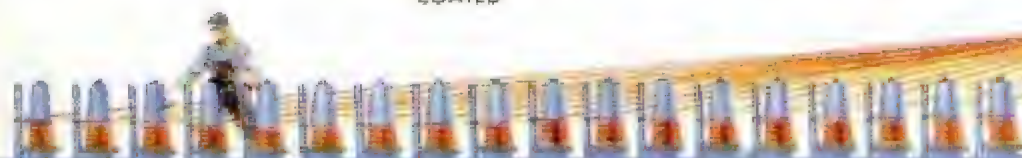
Industry converts stainless-steel wire into refrigerator trays and springs, into welding wire and plane rivets. Recording

COATING TIRE-BEAD WIRE WITH BRASS

COILS OF WIRE ARE LIFTED FROM TRUCKS BY HOIST AND PLACED ON 18 REELS ON EACH SIDE OF LINE



COIL OF WIRE TO BE COATED





Gleaming stainless-steel wire piles up on drums after passing through dies

wire also is stainless steel, as fine as a hair from your head. If you live along a sea-coast and admire your neighbor's gleaming rustproof fence, the chances are it is made of stainless steel.

Because the so-called stainless steels resist corrosion, they are invaluable in making certain products. But when man developed these special steels during World War I, he developed a material much harder than the proverbial nails. Stainless steel is just about the toughest infant in the neighborhood and consequently poses a good many problems in behavior.

A bright new plant at Waukegan, Ill., began turning out stainless-steel wire a

couple of months ago and may well become a full-scale laboratory for solving some of those problems. Jim Fenner, a top authority on wire drawing and superintendent of this new American Steel and Wire Company plant, says the difficulties encountered in drawing stainless-steel wire are not much different from those in drawing ordinary wire. Stainless steel is just more so.

A few hundred feet from the mill where Fenner's crews are patiently drawing stainless-steel wire, other crews are spooling up ordinary wire. They are using techniques as old as wire

itself to turn out the shiny stuff.

Any kind of wire is made by grabbing a metal rod and jerking it through a hole smaller than its own diameter. This squeezes and stretches the grains of the metal, cutting down the size of the rod but making it longer. Actually, it's just a method of stretching metal, like stretching a rubber band. Then if you pull it through another, smaller die you produce even finer wire. Probably the wire in your window screens came from Waukegan after being drawn through 20 dies.

Wire first was produced by hammering, but in the Middle Ages some bright metallurgist invented the modern system of



drawing. By 1430 iron wire was made essentially as it is today—but not with the same equipment. In those early days a wiremaker's best tool was a strong back. He'd pierce an iron block with several holes and drive it into a tree stump. After filing a point on a metal rod he'd stick it through the proper hole. Then he'd sit down on a swing in front of this wire mill, seize the pointed rod with a pair of pliers, lean back and push on the stump with his toes. If the swing, iron block, stump or his back didn't snap, he'd pull through a few feet of wire.

Today, whirling power drums pull wire through the dies at high speed. At the Waukegan plant, more than 75,000 miles of wire pile up on the drums each day. Most of it is round, but for special purposes it can be drawn in flat, square, triangular, oval and other shapes.

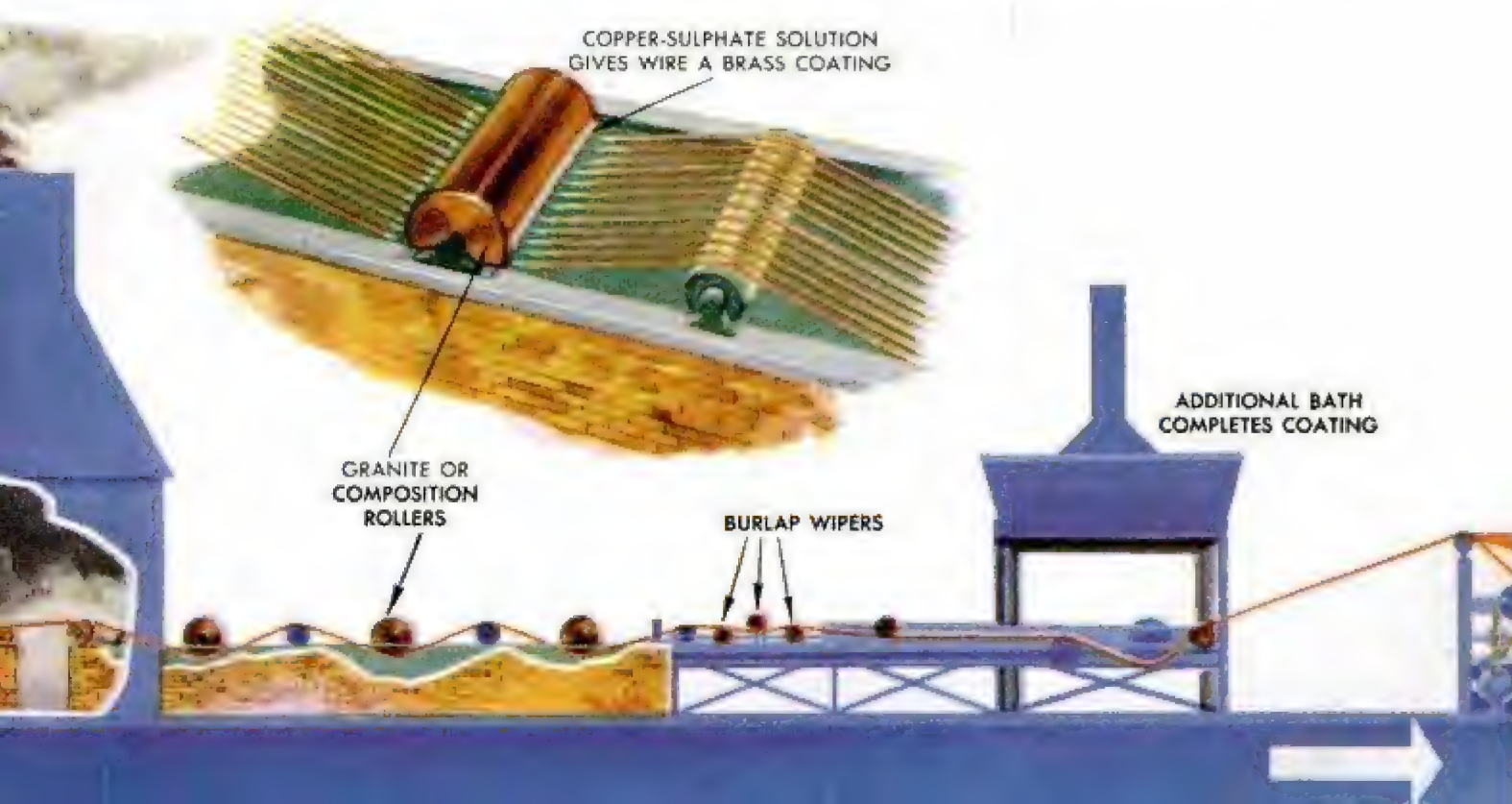
Raw material comes into the mill in 4500-foot coils of hot-rolled steel rod, normally about the diameter of a lead pencil. Days later this same rod may be shipped out as a tiny thread of steel no larger than a human hair but about 180,000 feet long. The rod goes through the first draft at a speed of about 350 feet per minute, but in the final draft piles up at 1000 to 3000 feet per minute. It takes about 12 drafts through 12



"Rod ripper" tugs rod through first die as worker stirs up soap lubricant

successively smaller dies to stretch the rod to this length.

When a coil of rod first comes into the mill, scale and dirt are removed by dunking it in a sulphuric-acid bath. Later, it is washed and soaked in a solution of lime. The lime neutralizes the acid and also acts as a lubricant when the rod passes through the die. The coil is baked in an oven to about 300 or 400 degrees to solidify this lime coating and remove brittleness from the metal. It then is flash-welded to other coils. A workman shoves one end of the entire bundle into a machine that points or "swedges" it, and at last the rod is ready to be yanked through the first die.



You can hold this die—the heart of the sprawling wire industry—in the palm of your hand. Dies are divided into four zones; the entering angle, the doorway through which the wire and lubricant pass; the approach angle where the wire is squeezed into shape; the bearing angle which determines the final shape and size; and the back relief angle, which prevents edges of the hole from breaking away.

Dies are made of tungsten carbide, almost as hard as a diamond. But they are pitted against an enemy that always wins—the terrific strain and heat that wear them down, so that they must be reamed out to the next larger size before they can be used again.

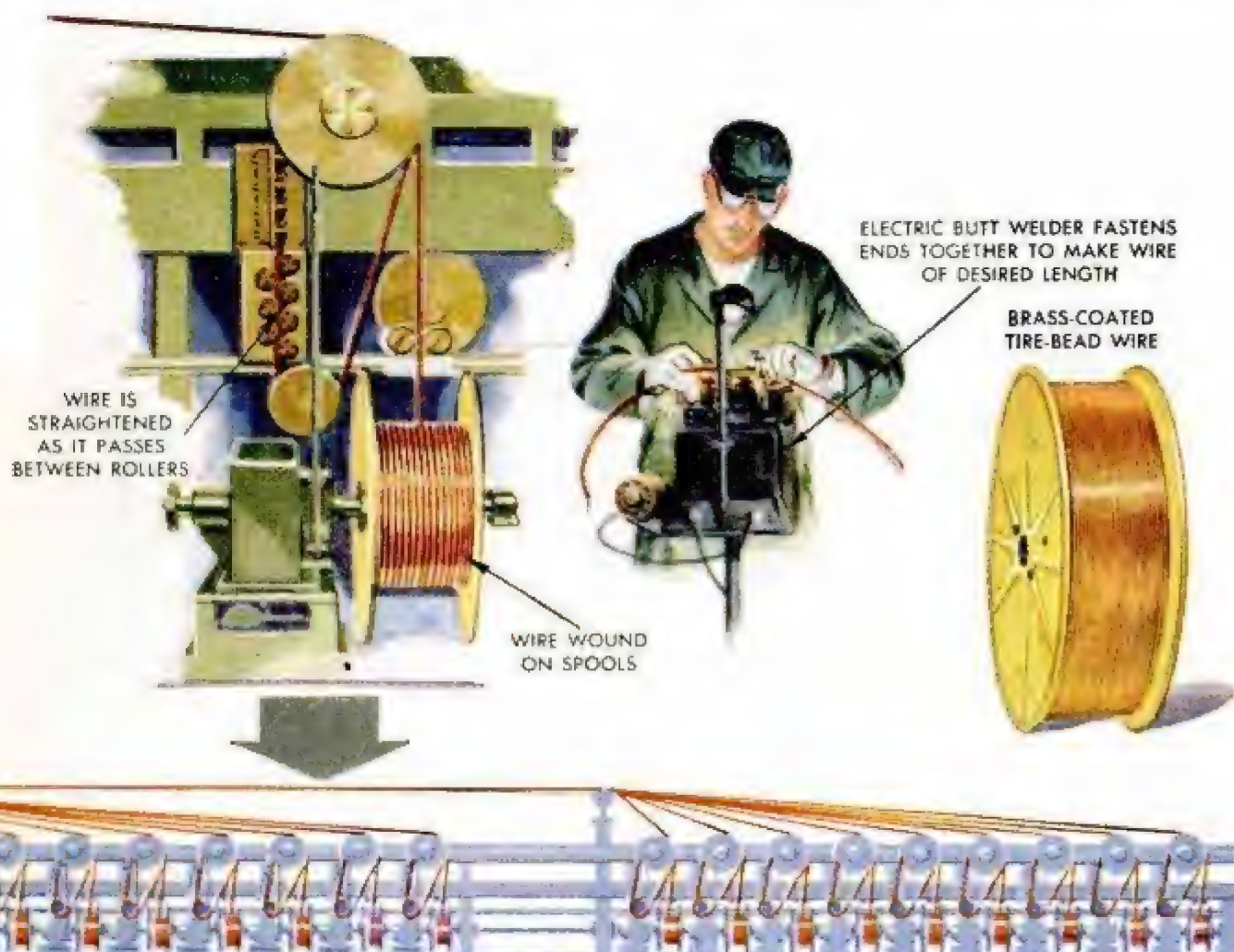
A vise holds the die securely in position. The pointed end of the rod is pushed through the die and grabbed by pincers that tug the rod through the hole and wrap it around the power block. As the block whirls, it drags the rod through the hole to transform it into wire. After the rod has passed through one die it is called wire; successive drafts make the diameter smaller and the wire longer. The diameter of the wire is reduced an average of 30 percent each draft.

The lime coating plays its part almost instantaneously as the wire grinds through

the die, acting as a lubricant to reduce the terrific friction. And just in front of the die the rod passes through another lubricant, usually soap or grease, which performs the same task.

At the instant the wire squeezes through the hole, the friction is so great the heat would ruin the wire if it weren't controlled. In some cases water is circulated through the die casing to dissipate this heat, and in every case air is blown on the block to cool the hot wire.

Ordinary wire machinery pulls the rod or wire through a single die and coils it on a drum. Then it is stripped off this drum, swedged again and passed through the next die. This laborious process is repeated until the wire is drawn to the desired size. However, the ingenious modern continuous-drawing machines pull the wire through as many as 14 successive dies without removing it from the block. The wire travels a looping path through the first die, around a block, through the second die, around the second block and continues until it is drawn to the proper size in a single operation. Because each block must rotate faster than the preceding one in order to accommodate the lengthening wire, this process is as intricate as the movement of traffic on the Indianapolis Speedway.



In addition to stretching the filament, each die also smashes the small grains of steel together, hardening the wire. Eventually, it becomes so brittle it would break if left untreated. To counteract this, the wiremaker heats or anneals it in a furnace, which permits the distorted grains to relax, relieving all internal strain and leaving the wire soft and ductile.

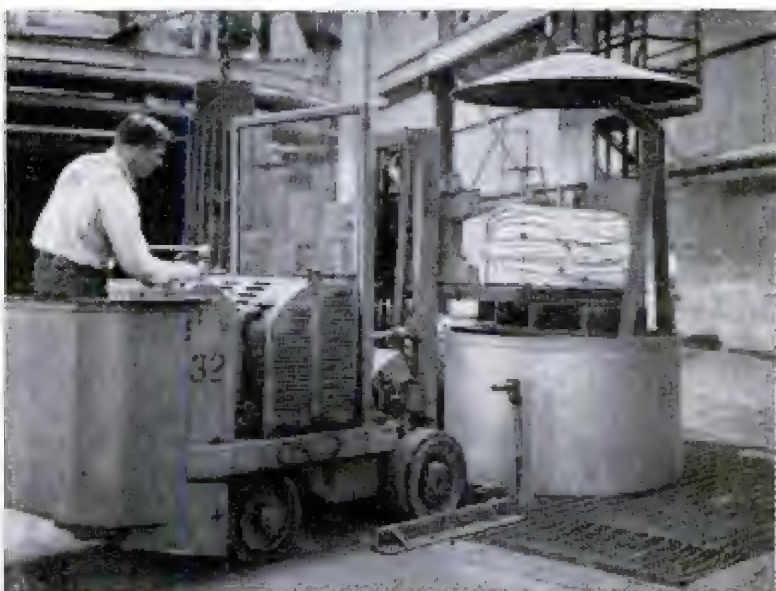
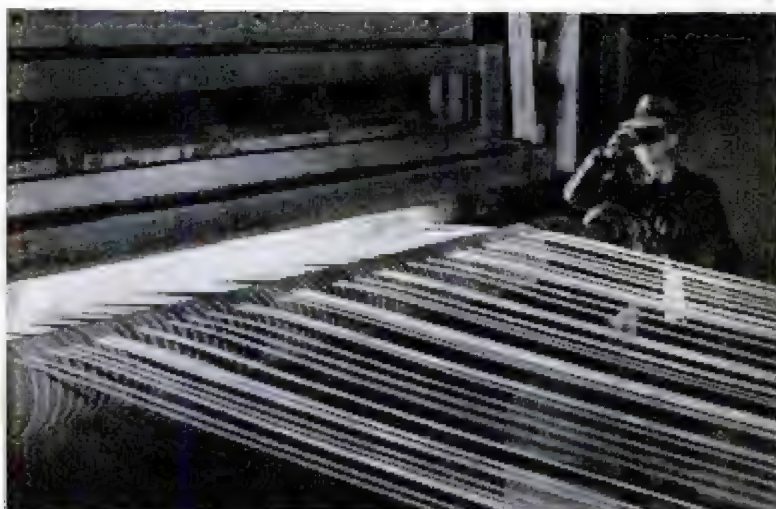
When he has drawn the wire to the desired size, the wiremaker gives it any kind of coating ordered by the fabricator. For example, wire for the beads of your automobile tires must be brass-coated to provide a surface to which rubber will cling. The wire travels along a 300-foot coating line, dipping in and out of a bewildering number of heat treatments and baths. Near the end of this line it runs through a solution which coats it with a thin film of brass. The steps in this fascinating process are shown in the diagrams on pages 89 through 92.

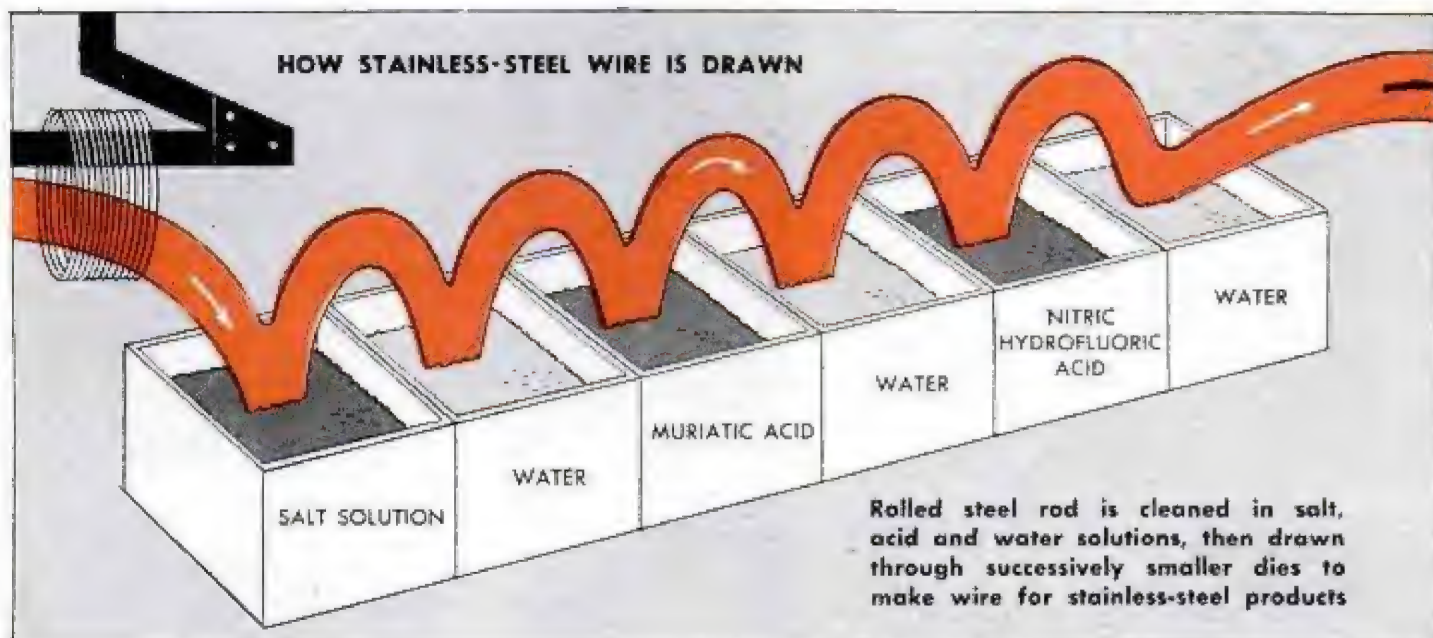
Wire to be used outdoors for fences or guy wires must be galvanized. Such strands pass through a hot-lead bath which softens them, then through a cleaning bath and finally through molten zinc which adheres to the clean surface. Or the wire may be galvanized by an electrolytic process. In either case, the result is a wire that won't rust. Tin or copper coatings are vital to still other types of wire.

All wire at Waukegan is "cold drawn"—unheated when it is tugged through the die—although most of the coatings are applied by hot baths.

What happens to the wire after it is drawn and spooled depends upon the use for which it has been designed. A great deal is shipped out for use as is. About 20 percent of all steel wire runs through nail-making machines, which clip it to the desired length, point each section on one end and hammer out a head on the other. Still more of it goes to a staple-making machine

Top, sparks fly as bundles of rod are welded together to make drawing continuous. Center, as strands pass through a heat-treating furnace, a metallurgist checks the temperature by noting color of rods in optical pyrometer. Right, white-hot stainless-steel rod is dropped on the quenching platform which will lower it into the water





where it is sharpened on both ends and bent into the shape of a horseshoe.

The Waukegan plant also turns out a good many wire springs ranging from mammoth 200-pounders to springs so small it takes 1000 of them to weigh $\frac{1}{10}$ pound. This wire first is straightened as it is taken from the coil, heat-treated, then turned in spring-making machines to produce the desired spring size.

Plunk the new "E" string on a violin or a mandolin and you are vibrating the strongest wire ever made. This same wire, only recently developed, makes it possible for a banjoist to hit an octave above middle

Power hoist lifts a coil of carbon-steel wire off end block. In foreground is the vise which holds the die



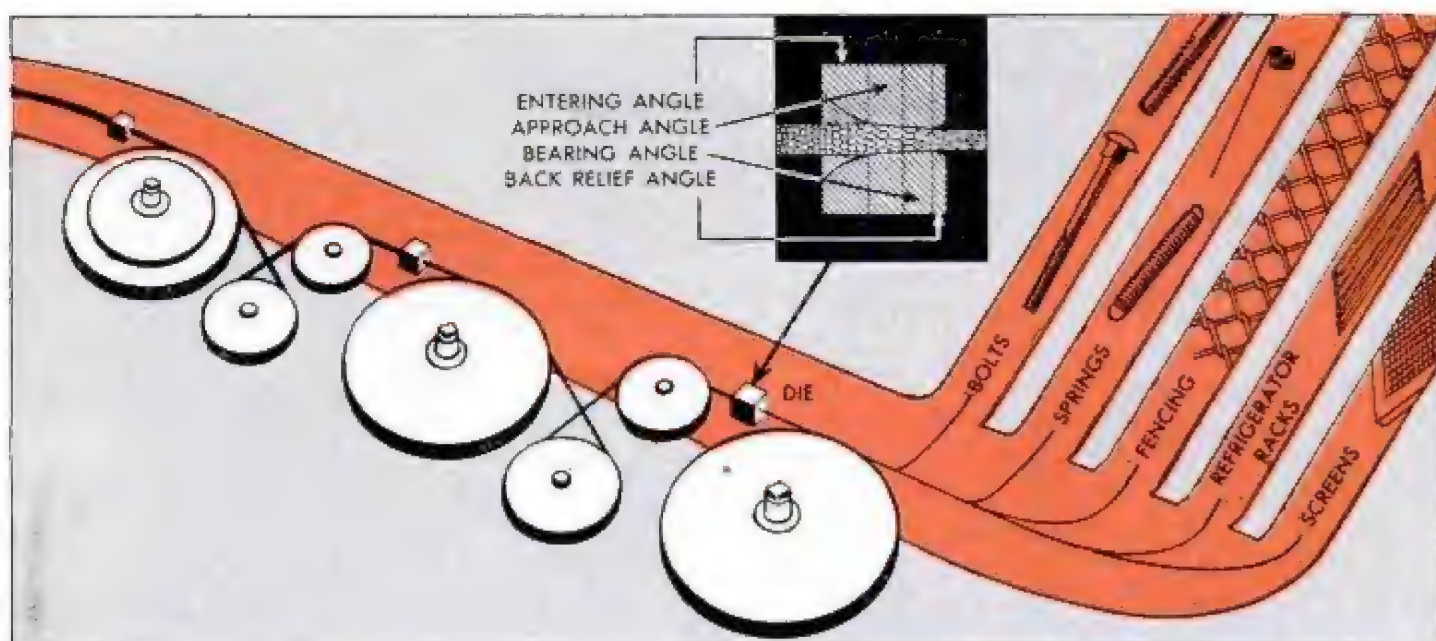
"C," which apparently has been the goal of the banjoist since the days of the minstrel show. The wire in cross-section area is twice as strong as the strands fabricated into the cables that support the suspension bridge across San Francisco Bay.

Wire, like wine, improves with age up to a certain point. After it passes through the die for the last time, the small grains of metal are distorted and stretched, a posture that won't let them relax. This strain can weaken wire and must be eliminated in wires that require exceptional strength. Spools of such wire are set aside for long periods of time before they are used. Gradually the inner tensions are relieved and the entire wire relaxes. This process is called age-hardening.

Obviously, drawing ordinary wire is a ticklish process that can produce a good many worries. But to find the men who really are persecuted by a lifeless bundle of steel, step now into the new section of the Waukegan plant where wire made of stainless steel piles up on the spools.

Stainless steels are divided into groups depending upon the amount of alloying metals stirred into the recipe. Some are quite ductile, others are stronger and tougher than almost any metal made. Each type of stainless-steel rod requires individual treatment. The new Waukegan plant actually is an in-between stage in the development of stainless-steel wire—all the problems of mass production haven't been worked out but all the facilities are available when answers to the questions are found.

Cleaning stainless-steel rod is much more difficult than cleaning ordinary steels. A difficult group of chrome and nickel oxides are on the surface when the rod reaches Waukegan, and are cleaned off by dips in four acid and salt solutions.



Most important treatment of all is the annealing of stainless steel before it is drawn. Other types of steel are heated to moderate temperatures and then permitted to cool. But certain grades of stainless must be heated to temperatures ranging from 1300 to 2100 degrees F. and then cooled immediately. A workman on a lift truck scoops up a bundle of stainless-steel rod and wheels toward the door of a huge revolving furnace. An electric eye opens the door automatically and he dumps the rod on a platform in the white-hot interior. As soon as the bundle has been heated to the right temperature for a specific period of time, a signal flashes and the correct bundle appears automatically at the doorway of the furnace. Two such furnaces at Waukegan have a capacity of 4000 pounds per hour each.

The workman drives the fork of his truck into the furnace, plucks out the bundle and wheels it immediately to a cylindrical platform. The platform—really an elevator—sinks out of sight and a moment later the metal hisses as it is quenched in a cold-water bath. After a timed interval, the elevator automatically rises with the coil.

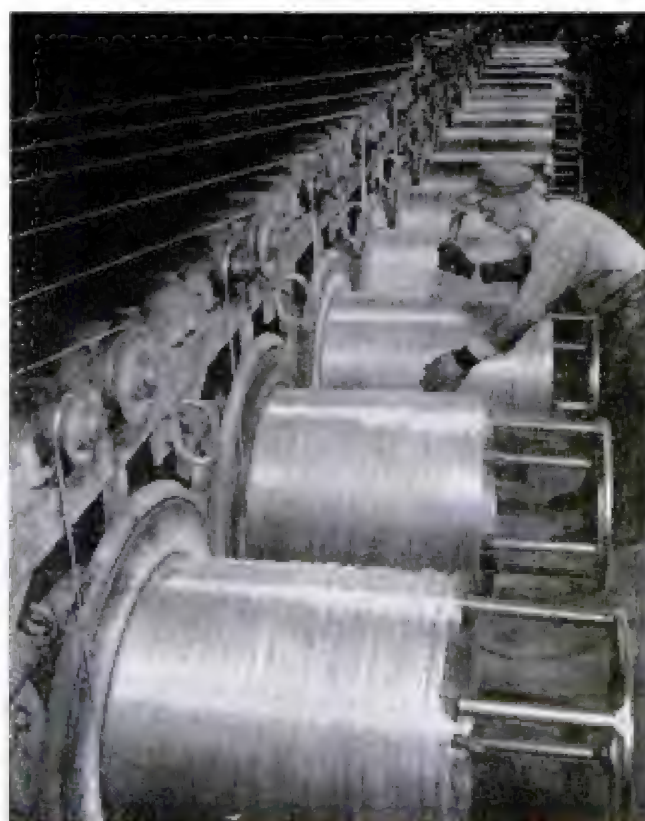
Drawing stainless steel through a die requires slow production and close attention. For example, it can't be drawn nearly as far between annealings. Therefore, it must be heated and cooled frequently. It is drafted at much slower speeds than the carbon steels. For multiple drafting, a heavy coating must be applied to protect the wire surface, which scratches easily. Each grade of steel requires a different practice because of its inherent characteristics. All the equipment for coarse wire-drawing is variable speed because the optimum speed for drawing stainless steel is not yet known.

Nature herself coats stainless steel. The

metal is believed to resist rust and other forms of corrosion because of a very thin, continuous, transparent film that forms naturally on the clean surface when it is exposed to air. This stain-resistance is increased by adding more chrome to the alloy.

Stainless-steel wire often is coated but not to protect it from corrosion. A copper coating sometimes is applied to wire designed for bolts and nuts. This coating acts as a lubricant when the metal passes through the machine which cuts threads and applies a head. Or the wire may be lead-coated if it is to be made into stainless-steel springs. Like copper, the lead

Galvanized wire piles up on blocks after zinc coating is applied. Waukegan produces 750,000 miles annually



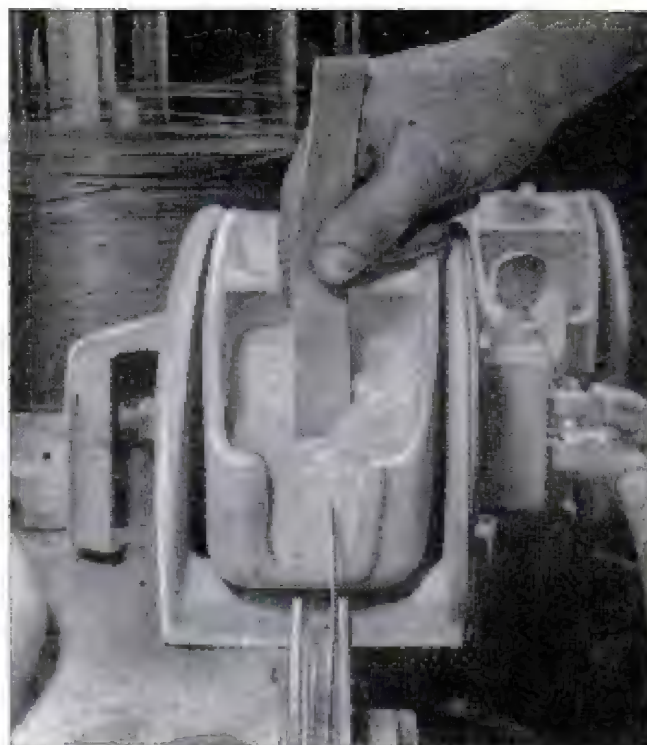


This high-speed machine turns out a real staple commodity. It stamps wire into 1000 staples each minute

acts as a lubricant in coiling the springs. Both copper and lead coatings usually are removed after they serve their purpose.

In cases where the wire is to be used in armature binding for motors, it is coated with tin. This makes it possible to solder the stainless steel satisfactorily.

If a bright finish is required, the wire may be "pickled," a process in which all lubrication is removed from the surface. Or it may be drawn through oil to give the wire an ornamental finish. A final draft



Powdered soap coats wire just before it enters the die, lubricating the strand against enormous friction

through a diamond die gives the wire its most attractive finish, smooth and bright. Drawn through soap, it acquires a finish with a minimum of luster.

The Waukegan plant has a rated capacity of 500 tons of stainless-steel wire per month. Whether it can attain this capacity depends upon whether Superintendent Fenner and his assistants can work out new techniques for mass production. Fenner says that stainless-steel wire is in its infancy—no telling how fast it will grow.

Waukegan plant makes the wire, then fabricates it into 50,000 types of springs. Big one weighs 200 pounds





Neon Sign Has Plug-In Letters To Permit Change of Wording

You do your own neon signwriting with a kit consisting of a display base and interchangeable neon letters that plug into the base to spell out your message. A wide variety of letters, figures and designs enables you to change your display at frequent intervals without buying a new sign. All symbols and letters have identical two-pronged bases that plug into sockets on two levels of the display. The replaceable letters also speed repair jobs.



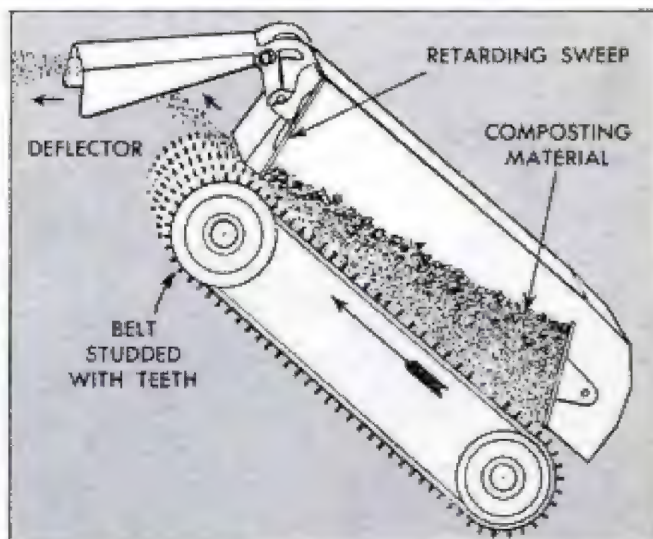
Mask Protects Against Heat Without Obstructing Vision

Providing full face and head protection without obstructing vision, a heat mask made of steel screen protects workers on furnaces, cupolas and other areas of intense heat. The 30-mesh steel screen deflects heat rays and prevents infrared burns. The mask weighs only 18 ounces and has a fiber chin rest and adjustable headband. For additional protection, a woolen bib and snood can be added to the mask by means of convenient snap fasteners.

Compost Processor Shreds and Mixes in One Operation

Compost is produced quickly by an electric shredder-mixer that shoots out a continuous stream of pulverized compost as fast as the hopper is filled. Shredding, aerating and mixing with lime dust and fertilizers are carried out by an endless

belt covered with steel teeth or sprigs that comb the materials into small particles and discharge the compost by centrifugal force. Waste materials and trash discharge at the lower end of the belt, which is mounted on a 45-degree slant inside the machine.





This is the Navy Corsair in which Cook Cleland set the present Thompson speed record of 396.131 m.p.h.

War Horses Still Fight Out

TREMENDOUS CHANGES have taken place in racing airplanes since the days of Jimmy Doolittle and Roscoe Turner. The present-day pylon polishers are no more like the ships flown by those famous pilots than are the modern Indianapolis racers similar to cars driven by Barney Oldfield.

Most of the changes have been due to the accelerated advancement made in high-speed aircraft and engine design during the war years. The backbone of modern high-speed air racers consists of a group of the world's fastest propeller-driven fighter planes stripped of their armament and other military accouterments with wings clipped and engines souped up.

Although the type of airplane which an individual could build in his garage no longer fits into this class of competition, this does not mean that individual ingenuity has had to take a back seat. On the contrary, the good old American backyard mechanic has found a challenge in the war planes. Since these craft were not designed specifically for pylon flying, or even for cross-country racing, there has been plenty of room for genius in adapting them to these purposes. Consequently, the types with the best war records have not necessarily dominated peacetime racing.

Most of our Army service types used during the war, and a few Navy aircraft

Endurance rather than speed helped Anson Johnson win the Thompson Trophy with this Mustang P-51-H in 1948





Clipped wings aren't permitted in the Women's Trophy Race, where the reliable AT-6s spread-eagle the field

the Air Derby

By John L. MacKenzie

as well, have found their way into the races. Both the Thompson Trophy Race, the world's premier closed-course competition, and the equally great Bendix Transcontinental Derby, have benefited by the participation of these planes. So let's take a look at the records and see how each has fitted into its new postwar role. At the same time we shall establish a basis of comparison for the 1949 National Air Races, which are to be held at Cleveland over the Labor Day week end.

The North American Mustang or P-51 was the fastest fighter plane produced by this country during the past conflict. Powered by a single Packard-built Rolls-

Royce engine of some 1700 horsepower, it was a favorite with Americans and their allies. In view of their speed characteristics, more P-51s than any other single type have been acquired for closed-course racing. However, they have not done as well as might be expected in the Thompson.

Anson Johnson, who won the big race last year, flew a Mustang. But he won by outlasting his competitors rather than by outspeeding them. In fact, his winning speed of 384.469 miles per hour was considerably below the Thompson record. Yet his was the best showing yet made by a P-51 in the pylon races.

In cross-country work, however, the

Lockheed P-38 was souped up by clipping a few feet off wings and stabilizer tips and adding 4400-hp. engines





Cook Cleland revs up one of his two Corsairs (F-2-G) in preparation for the Thompson Trophy take-off in '48. The plane has a 3500-hp. radial engine



Charlie Tucker clipped eight feet off each wing of his P-63 Kingcobra and qualified for the Thompson at 392 m.p.h. He is expected to race the plane again this year. Below, P-39 owned by Chuck Brown is towed to start line



P-51 has written a different story. The Bendix Derby in all three postwar years has been Mustang all the way. Each year all of the top positions have gone to this great ship. Not only has the well-known Paul Mantz scored three successive victories in this classic, but he has also cracked transcontinental records in his early model P-51. Jacqueline Cochran, ace ladybird, with a similar ship has given Mantz serious competition in (Continued to page 248)

Circular Gas Torch Is Plumber's Helper

Because it heats the entire circumference of a pipe at one time, a circular gas torch saves a plumber's time in sweating on pipe joints and fittings in hard-to-reach places. There are six jets on the torch, three on each curved section. It will heat pipes up to two inches in diameter. The torch will also thaw frozen pipes.

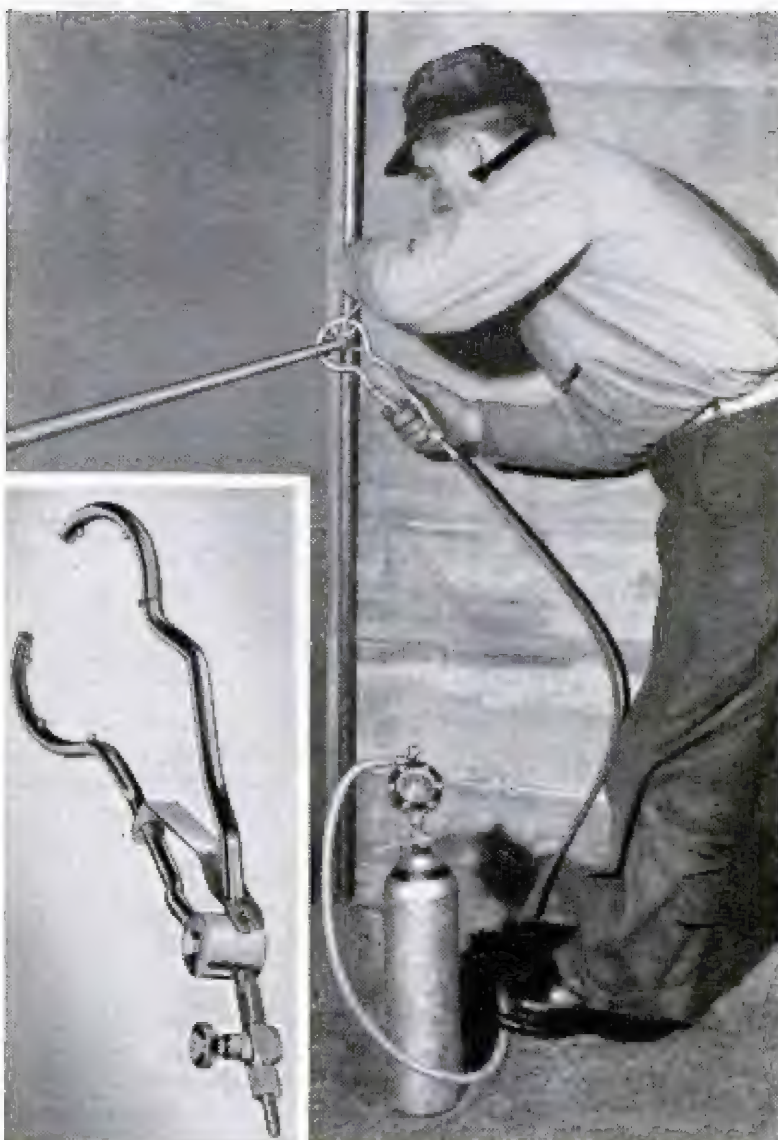
Whole Eggs Frozen

Whole eggs have been preserved by freezing at Louisiana State University by Dr. Socrates A. Kaloyereas. Vacuum and dehydrating agents were used to extract a sufficient amount of the eggs' water content to permit the expansion of yolk and white that occurs upon freezing. This eliminated the rupturing of eggs that had previously made the process impossible.

Lightweight Sinks of Plastic

Household sinks and washbasins made of plastics are now coming on the market. Extremely light in weight, the heaviest model manufactured is a deluxe bathroom fixture weighing only 7¼ pounds. The material is Lucite acrylic resin, which can be made transparent, translucent or opaque and in a variety of pastel shades.

The fixtures are formed by a combination of blowing, pressing and vacuum drawing; special models are being made for use on aircraft, trains and trailers.



Recorder Checks Eggs To Eliminate Lazy Hens

Lazy hens that don't lay the required number of eggs are soon found out at a breeding farm near Kirkland, Wash. Art Heisdorf, one of the owners, records the egg-laying activities of 10,000 chickens by talking into a wire recorder. Four days a week he visits each nest with the recorder, lifting each hen and then speaking her number and production into the microphone. An office girl transfers these records to individual cards. The owners then can check the egg production of any particular hen.

❑ Flat tires are the most frequent cause of automobile breakdowns with battery failures running a close second.

Pocket SOS

RESCUE probabilities for airmen forced down over water, jungle, desert or arctic terrain are increased by a new midget radio transmitter developed by the U. S. Air Force.

It is superior in everything but range to the wartime counterpart, AN/CRT-3, popularly known as the Gibson Girl because of its hourglass shape. The CRT-3 is too bulky and heavy for anything but large aircraft, where it will continue to be used along with the new equipment.

Radio beacon AN/CRN-16 weighs only two and a half pounds, in contrast to its forerunner's 40 pounds, and is small enough to be tucked into the pocket of a life vest or a parachute harness. The Gibson Girl has to be shifted to a life raft during ditching, or dropped by separate parachute, both ways risking the possibility of loss. With the new sets, every flyer will always have his own SOS sending facilities, even if separated from his crew.

It operates on the "line of sight" principle, sending out a continuous distress signal at a frequency of 140.58 mc., modulated by a tone varying with the speed at which the generator hand crank is turned. Planes flying at 2000 feet can pick up the signal 50 miles away. The older model can be heard several thousand miles away when used under ideal conditions.

For an antenna, the CRN-16 uses either a short, telescoping rod or a folded loop. The Gibson Girl requires 306 feet of antenna wire, payed out by kite or by balloon.

Air Materiel Command photo

Right, individual SOS signal transmitters are built in two sections, both small enough to fit in a flyer's jacket pocket

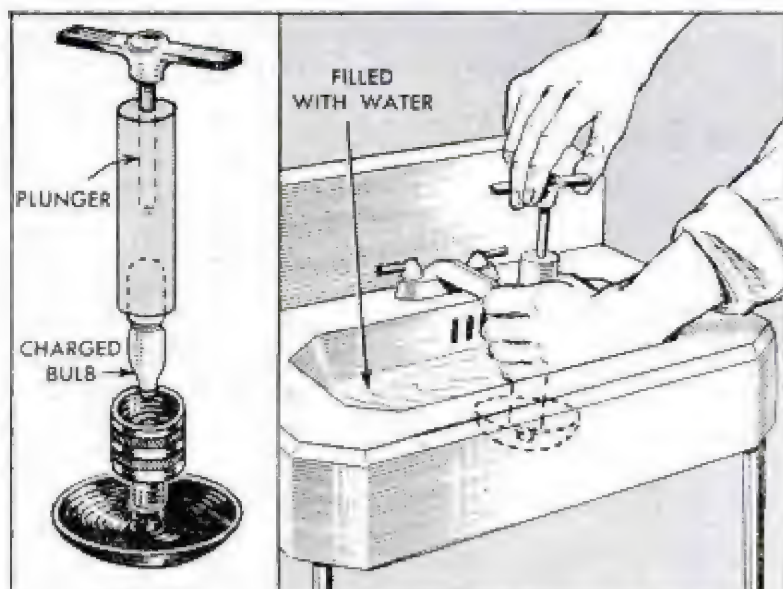




Boat Glows at Night

Because he was almost run down by speedboats as he fished from his boat at night, an Illinois fisherman painted his rowboat with luminous paint both inside and out. The outside paint makes the boat

clearly visible at night, thus offering protection from collisions. The inside paint throws off enough light so that he can see to bait his hooks. He used two coats of lead-free undercoat, then two coats of the luminous paint and, finally, a coat of clear spar varnish for weatherproofing.



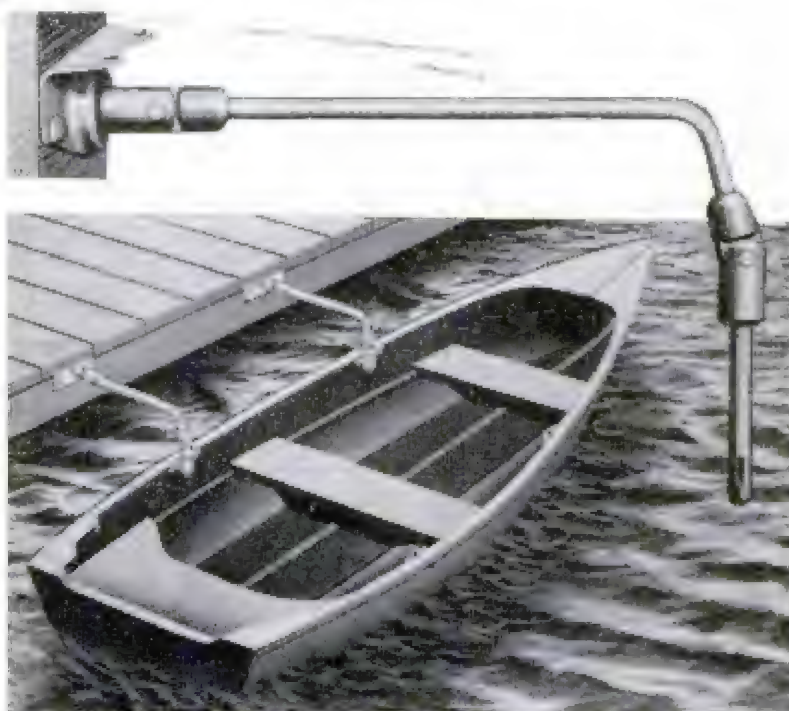
Jet Drain Opener

With a sudden surge of gas, a home plumbing tool opens clogged drains. Carbon-dioxide cartridges—the kind used in seltzer bottles—provide the discharge of gas. A cartridge is placed in the tool and a rubber seal is held over the drain opening. After the receptacle is filled with water the tool's handle is twisted, puncturing one end of the carbon-dioxide cartridge to release a jet of gas down the plugged drain. Pressure exerted at the drain opening is carried by the water column to the point of obstruction.

Pins Drop in Oar Sockets To Moor Small Boat

By simply dropping the pins of a new boat hitch into the oar sockets you can moor a small craft to a pier or boathouse. The hitch "anchors" the boat 6 to 14 inches away from the pier to prevent damage, yet leaves it free to ride up and down or rock with the waves. The hitching pins are pulled out of the sockets to release the boat.

☐ Satellite rockets whirling around the earth at an altitude of 4000 miles may some day broadcast televised images of cloud movements to help forecasters predict weather.





Copyright "Mechanics"

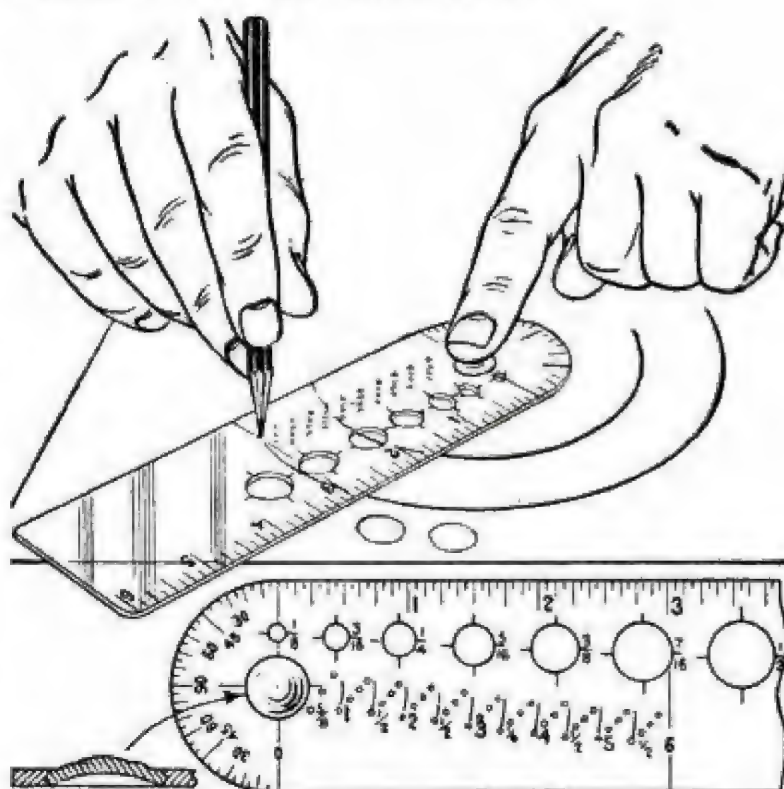
Camera Goes to Sea to Televisе Boat Race

Television rode the waves of the Thames in a British experiment to transmit this year's historic boat race between Oxford and Cambridge. The British Broadcasting Company cooperated with equipment manufacturers and the General Post Office in transmitting close-up pictures of the crews as they pulled at their oars. The

camera was mounted in the bow of a 60-foot launch that followed the boats during the race. Transmitting and control equipment were housed in four "suitcases" amidships. Receiving stations located at high points along the shore picked up the video signals from the launch and transmitted them to receiving sets.

Single Drafting Aid Combines Four Drawing Instruments

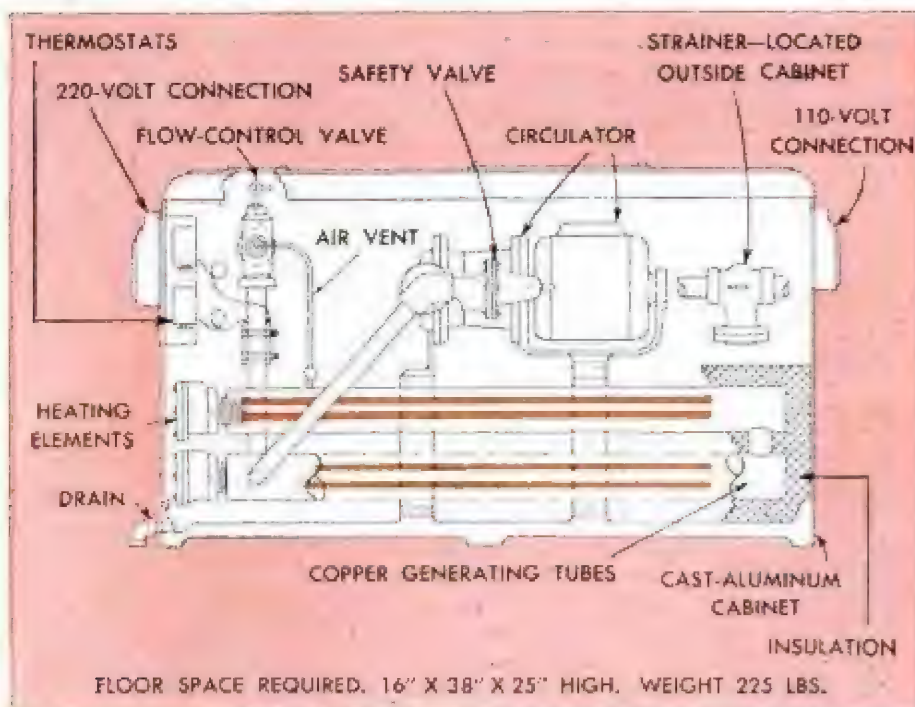
Combined in a single pocket-size drafting instrument are a compass, protractor, ruler and square. Stamped into the transparent plastic are circles graduated from $\frac{1}{8}$ to $\frac{1}{2}$ inch. Circles from $\frac{5}{8}$ to 6 inches can be drawn by centering a pivot, placing the pencil point through the proper hole and using the instrument as a compass. The rounded end is marked for use as a protractor and one side is scaled for use as a ruler. The transparent pivot also serves as a magnifying lens.



Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT INDEX, which is available to readers without charge from Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11

Pontoon-Type Sailboat

Capable of speeds up to 15 miles an hour, a pontoon-type sailboat weighs only 98 pounds complete with sail, yet is seaworthy enough to take the rough waters of oceans and large lakes. A dagger-type centerboard is easily raised and lowered through a watertight slot in the hull. Guard rails and a non-slip deck provide secure seating for the helmsman and passenger despite the lack of a cockpit. With a length of only 11 feet 7 inches and a beam of 2 feet 7 inches, the craft is easily carried on the roof of a car. The lightweight boat is extremely buoyant and, if overturned, can be righted without lowering the sail.



Electric Generator For Hot-Water Heat

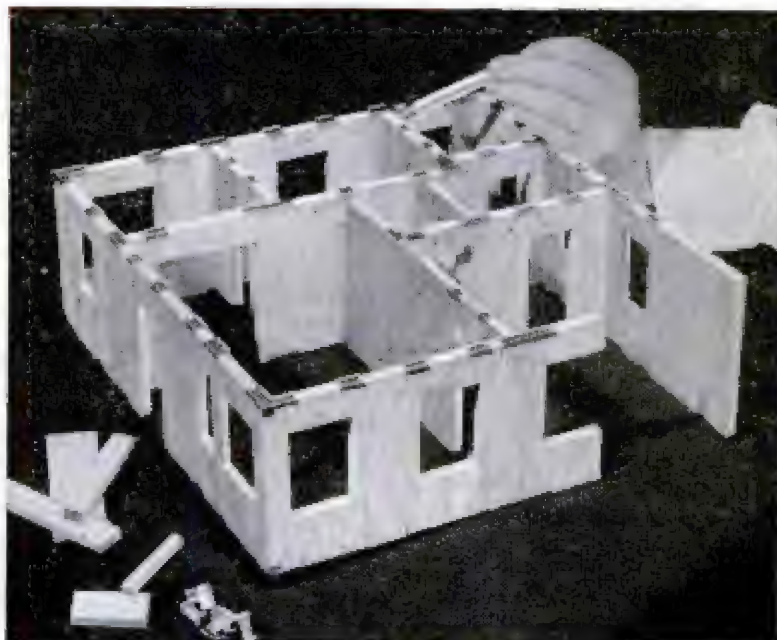
All types of hot-water heating systems can be operated by an electric generator that has automatically controlled heating units. It is built in models from 10,000 to 48,000 watts, supplying from 228 to 1094 square feet of radiation.

¶To prevent infections from mercury dust released by broken fluorescent tubes containing beryllium phosphor, manufacturers are producing tubes with non-poisonous phosphor.

Toy "Prefab" Building Kit

Made of plywood, a toy "prefabricated" building kit contains various sections cut on a scale of $\frac{1}{2}$ inch to the foot. Metal clips connect the parts to form buildings of various shapes and styles. With the toy, boys can build small homes, garages and other structures for their model railroads while their parents can see what a new home they plan to build will look like.

¶Agricultural engineers at Madison, Wis., are experimenting with electric heaters for beehives to prevent the heavy losses of bees by winterkilling.



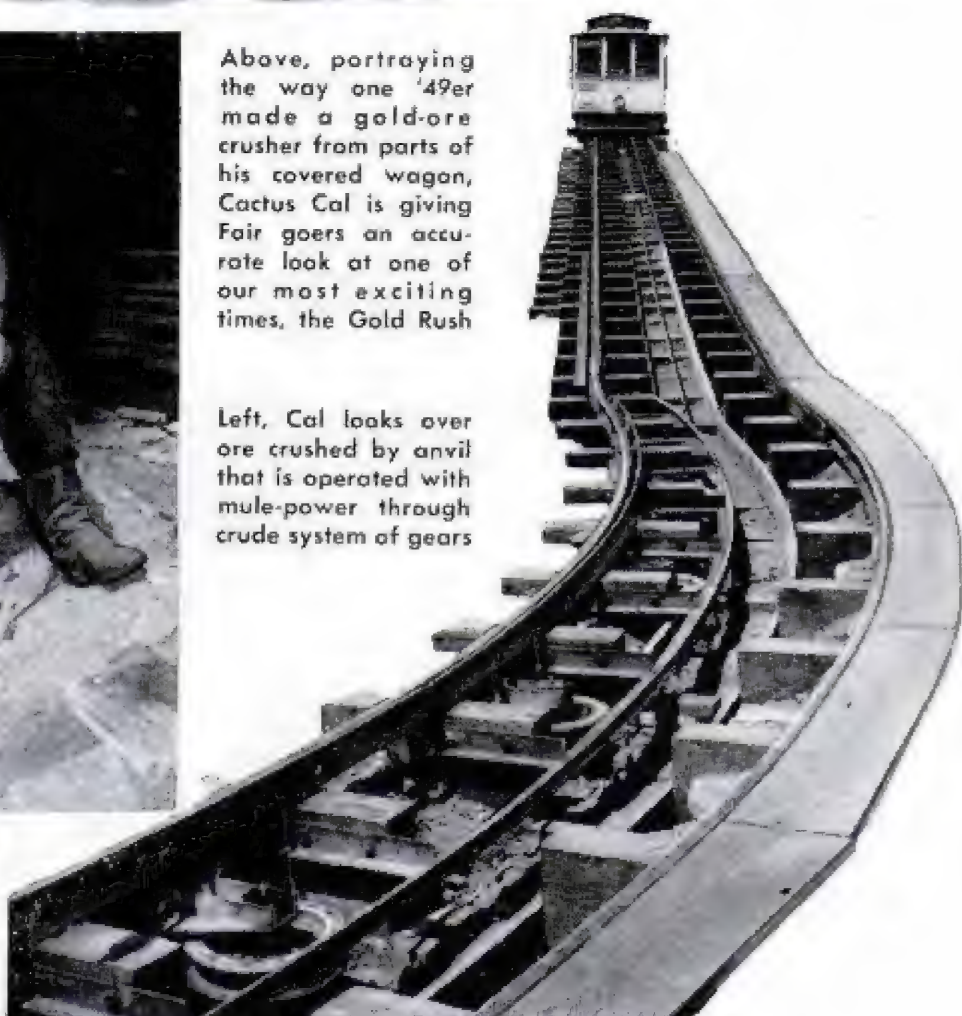
Old-Timers Come to the Fair

At the 1949 Chicago Railroad Fair, yesterday and today join hands to present a panorama of U. S. history. Colorful new exhibits, not in the 1948 Fair, are helping make this repeat performance another big hit.



Above, portraying the way one '49er made a gold-ore crusher from parts of his covered wagon, Cactus Cal is giving Fair goers an accurate look at one of our most exciting times, the Gold Rush

Left, Cal looks over ore crushed by anvil that is operated with mule-power through crude system of gears



Right, a little of San Francisco at the 1949 Railroad Fair is this cable car, transplanted along the shores of Lake Michigan. The car operates continuously, providing free rides for the Fair customers

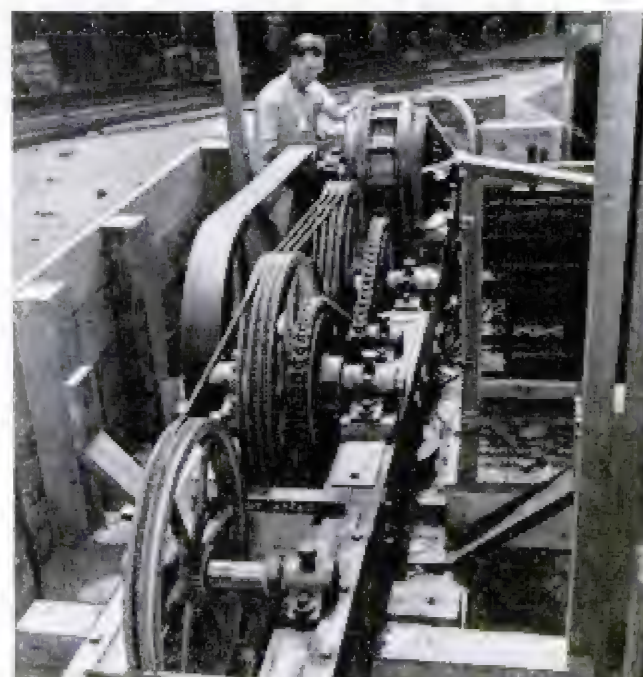


Above, controls of the cable car are simple. Lever in the center raises and lowers the grip that grabs the cable to move the car. Other levers are brakes



Above, right, head-on view of the transplanted cable car. Gripman is yanking the bell cord. San Francisco natives are proud of the "music" played on these bells

Right, the cable-winding mechanism at Chicago is just a pint-size version of the machinery at San Francisco. Most of these parts had to be custom-made for the job



Below, there's even a turntable at the end of the run and customers are expected to help swing the car as they do in the coast city. This is a test operation





Container Blows Seed Over Lawn

Grass seed is blown across a lawn by a new container that operates as an air pump. The user holds the top section of the cylindrical container with one hand, grasps the bottom section with the other, and pumps. With the container pointed at an angle of 45 degrees, the seed is blown out in an even spray.

Multi-Bladed Scraper

Scraping operations are speeded by a flexible scraping tool that has 11 blades loosely mounted in V-slots in the rubber holder. Pivoting from the top of the V-slots, the blades always present a sharp edge to the surface. Because the blades are almost glass-hard, the tool can be used on steel, wood, plastics, iron, plaster and other materials. It will smooth down everything from rough welds to fine woodwork without gouging. The blades are reversible and can be sharpened in the flexible holder.

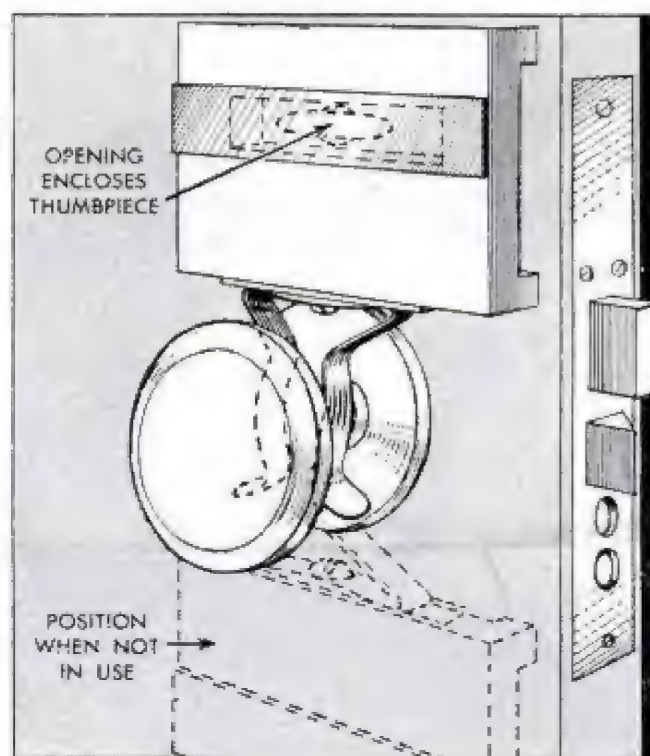


"Tugboat" Catches Mice

As many as 10 mice can be caught at one setting with an automatic mousetrap that looks like a miniature tugboat. The trap has a superstructure made of transparent plastic built-in sections to catch mice without sacrificing the bait. The mouse, approaching the bait from any direction, steps on a spring platform. This drops him down a hatch, and his only exit is through a trap door that leads to a perforated aluminum container from which there is no escape. Next, the boat is set afloat, thereby drowning the mouse or mice.

Metal Plate Burglarproofs Door

Apartment dwellers can make their entrance doors burglarproof with a small metal plate that clamps to the doorknob and prevents the latch thumbpiece from turning. A narrow slot in the plate fits over the thumbpiece, making it impossible to release the bolt either by force or key. It can be left on the knob when not being used.

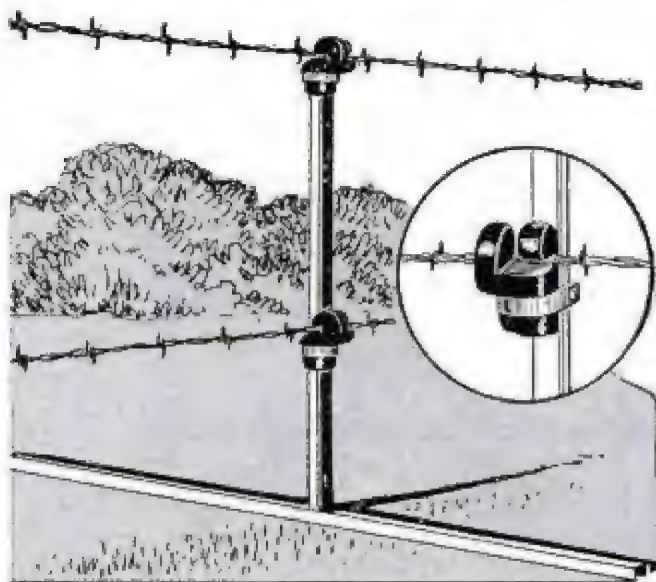




Auto Clothes Rack Can Be Carried Into Hotel

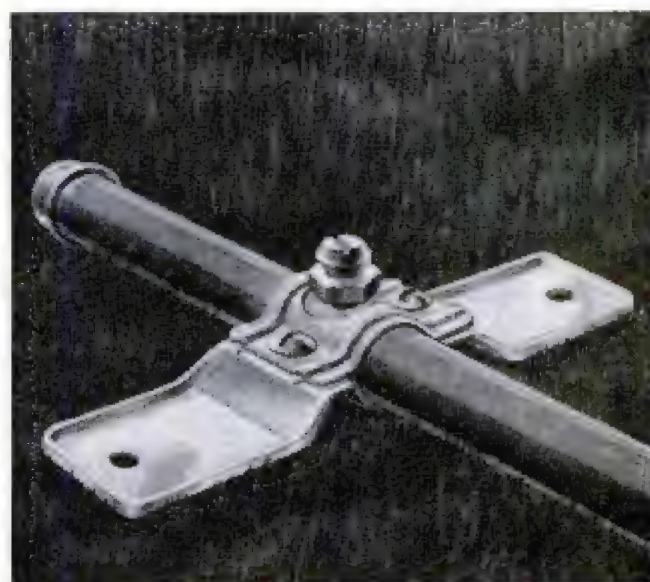
Quickly detached from its window-frame bracket, an automobile clothes rack makes it possible to carry the garments from the car into the hotel and hang them up in a closet without removing them from the rack. Six to twelve garments can be

hung on the rack, which is supported by the window frame and does not interfere with the operation of the window. An elastic strap is fastened around the clothes and prevents them from swinging when the car door is opened.



Portable Electric Fence Post

Farmers can build electric fences within a few minutes by using portable posts that stand on top of the ground. Each post has a right-angle bar on the base which gives it firm support. The wire, smooth or barbed, is placed in a plastic insulator. When the post is turned 90 degrees, the insulator grips the wire. The posts permit the farmer to eliminate much permanent fencing.



Old Hose Made Into Sprayer

Worn-out garden hose can be used with new adjustable spray units to water an area as large as 600 square feet. There are five units in a kit, five hose holders, a small hand punch and a hose end cap. Holes are punched along the hose at approximately 10-foot intervals and the sprays screwed into the hose body. One or more units can be closed off.

HUGE ROCKET MOTORS that are contemplated for the future—up to 10 times more powerful than the motors of V-2s—are to be studied in a new test stand built into the face of a cliff in the Organ Mountains, overlooking the White Sands Proving Grounds in New Mexico.

Resembling a massive Mayan temple from a distance, the test installation consists of a pair of fuel houses—each of which can hold 15,000 gallons of fuel, two adjacent pump houses and the motor test frame itself. An 80-foot sheer rock wall below the test frame provides space for the flame from the power plant. When mounted in firing position, the motor is pointed downward at an angle of 60 degrees from the horizontal to avoid spoiling of the natural rock sluiceway.

Each of the large fuel tanks is surfaced inside with virtually pure aluminum, necessary to withstand the "malignant" acid fuels that are being developed for possible rocket use. The fuel houses have lightweight roofs that would offer little resistance in case of explosion and the tanks have quick-opening, large-orifice dump valves and long concrete spillway troughs so that the fuel could be rapidly removed

in case of emergency. In addition the contents of a 100,000-gallon tank of water can be dumped through the fuel tanks and on into the open desert to hasten removal of the fuel.

Around one shoulder of the cliff an entrance door leads to a tunnel that has been cut through the solid rock to a control room in the face of the cliff about 100 feet to one side of the motor firing position. Here technicians will be able to observe the jet flame by peering through armored glass ports at diagonal polished stainless-steel mirrors placed at a 45-degree angle outside the control room.

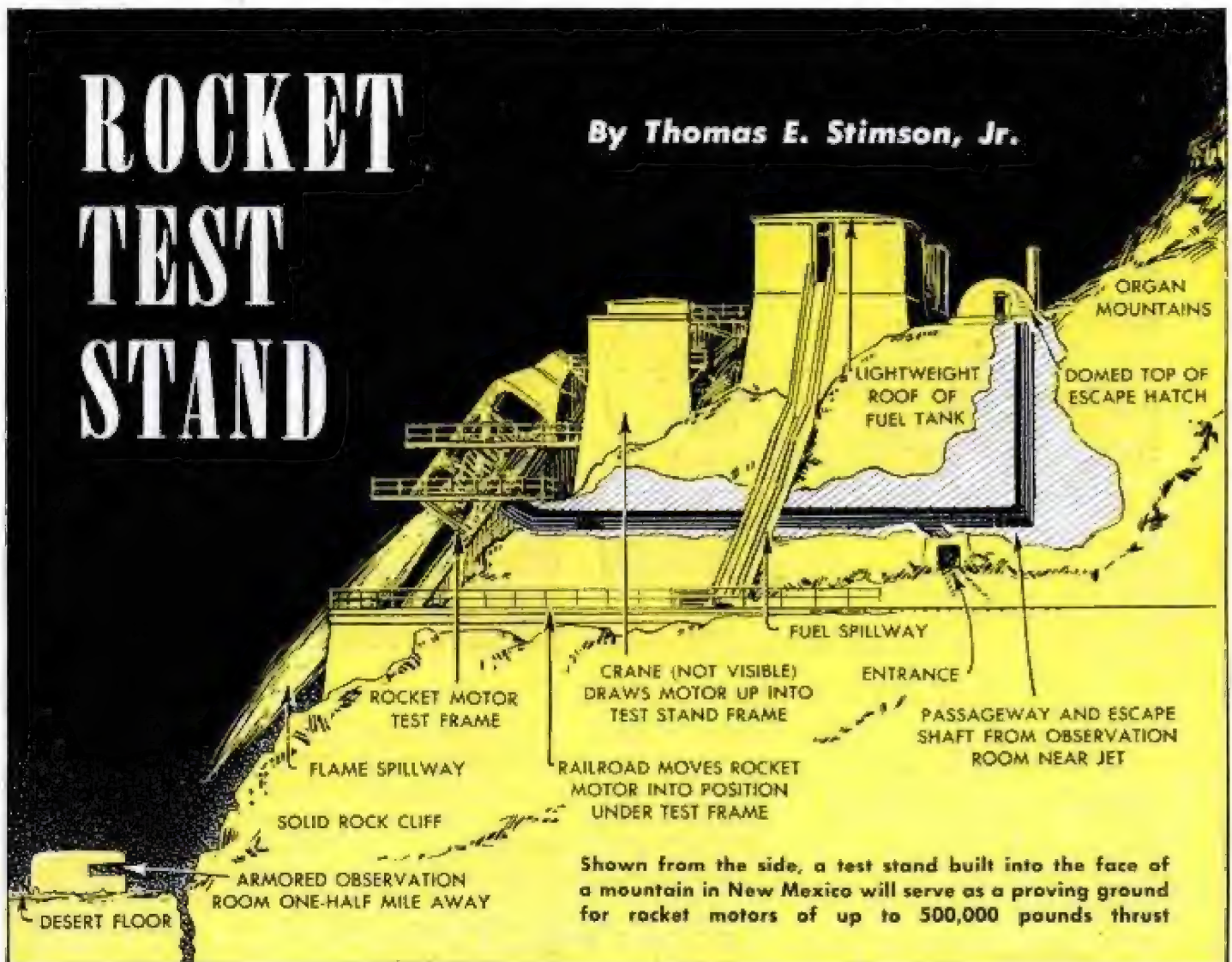
The tunnel inside the mountain has numerous baffles to prevent the spread of possible fire. It also provides access to a 100-foot-tall escape hatch up which the technicians can climb to a safe elevation if something goes wrong. An armored pillbox at the top of the escape hatch leads out onto the surface of the mountain.

An additional armored observation post from which the jet flame can be observed is located $\frac{1}{2}$ mile away on the desert floor.

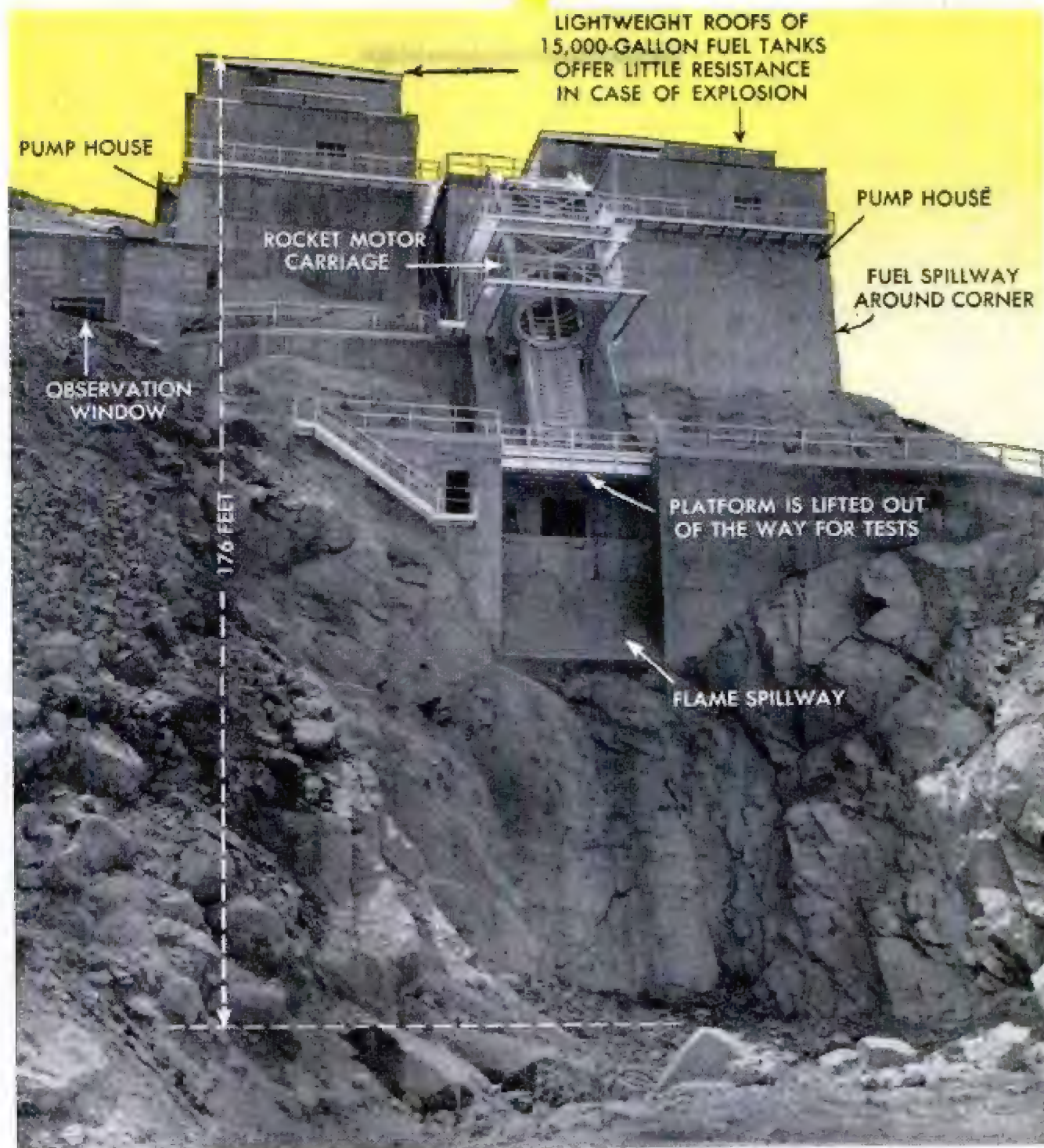
Rocket motors that are to be tested will be transported to a position under the test frame on special railroad cars. Then they

ROCKET TEST STAND

By Thomas E. Stimson, Jr.



Shown from the side, a test stand built into the face of a mountain in New Mexico will serve as a proving ground for rocket motors of up to 500,000 pounds thrust



will be hauled up into position in the frame by a mobile Lorraine-type crane, which will also be used to remove the rail trackage below the test stand before a motor is tested. Another purpose of the crane is to aid in the exchange of pumps so that pumps of varying characteristics can be used to provide the correct mixture ratio of fuels for the particular motor under test.

The Organ installation is capable of testing rocket motors of up to 500,000 pounds

Test stand from front, showing 80-foot-high spillway for flames from motors. Below, concrete observation post, ½ mile away on desert





Looking up into the test frame. Rocket motors are drawn up on rollers in foreground by a mobile crane

thrust, of either solid or liquid type, for as long as two minutes. Due to refinements in design, motors of 500,000 pounds thrust would be only approximately twice the size of a V-2 motor.

To be put in use this winter, the motor test stand will allow measurement of motor vibration in three planes during burning, measurement of the velocity and temperature of the jet stream, measurement of temperatures and pressures inside the



Frame holds motor pointing downward at angle of 60 degrees to avoid damaging a natural-rock sluiceway

combustion chamber, and measurement of the amount of static electricity and ionization that is generated by the jet stream. The amount of absorption of radar waves by the jet stream also will be studied.

Eventually an identical test facility is to be built alongside the present one so that the present control room can be utilized for a larger number of tests simply by turning the exterior mirrors toward the rocket motor that is to be tested.

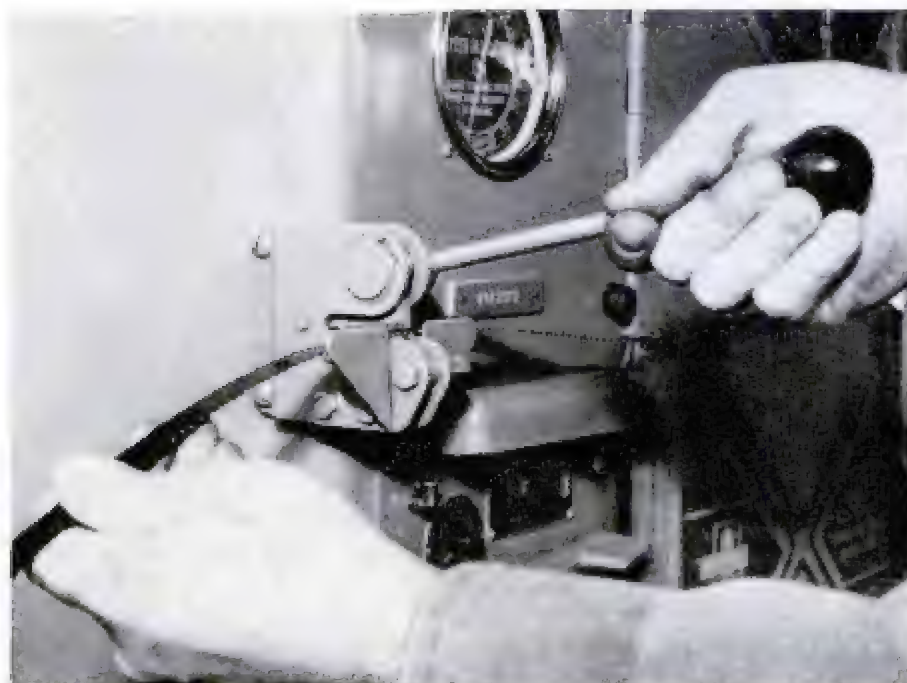
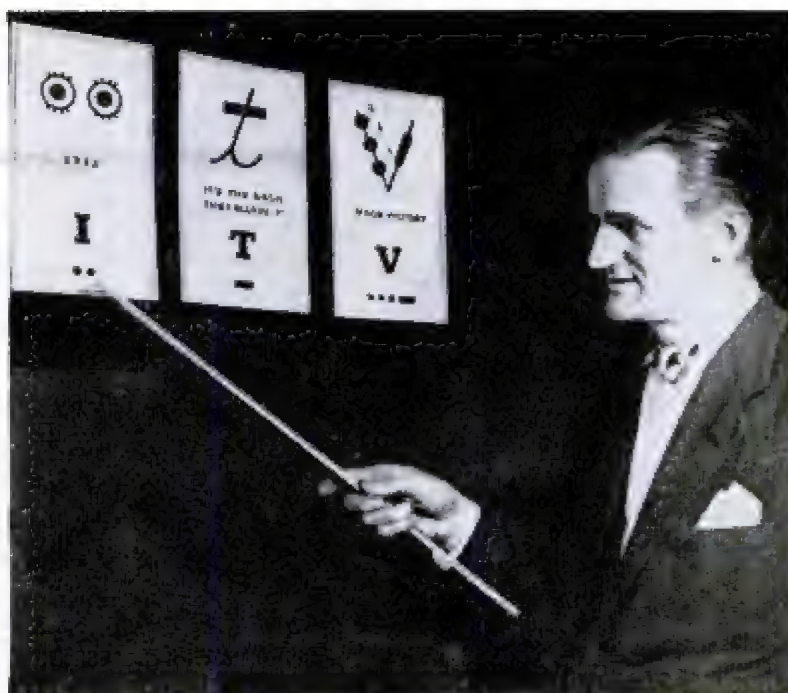


Left, in case of fire, fuel can be dumped down spillway and pushed out onto the desert by 100,000 gallons of water. Below, reinforced pillbox at the top of a 100-foot-tall escape hatch leads out onto mountain



Code Taught in Hour By "Sight" Method

Morse International Code is learned in a fraction of the usual time with a visual method of associating the code symbols with the shape of the letter. The letter "I", which consists of two dots in code, is shown as two bull's-eyes with the key word "eyes" printed underneath. The "T"—a dash in code—is printed with the crossline or dash emphasized. Different visual aids, one for each letter of the alphabet, are printed on colored cards. The inventor, a commercial artist, says it is possible to learn the complete code in less than an hour with his method.



Saw-Blade Shear Makes Square Cut

Mounted on the side of the bandsaw, a three-blade shear cuts bandsaw blades square and flat to assure a perfectly matched weld. It speeds the welding operation because no preparatory grinding of the ends is necessary. A squaring plate accurately positions the blade as the pivoted shear comes down between two knife-edge blades. The shear removes a narrow section of the blade, thus cutting out the old weld.

"Insect Gun" Swats Flies Between Two Paddles

Latest weapon in the war against flies is an "insect gun" invented by Peter Jacobsen of Denmark. When the trigger handle of the gun is squeezed, two arms swing forward suddenly to trap the insect between two transparent swatters. A "sight" on the gun is touched to the wall above the fly so the user can gauge the proper distance to the insect.

¶In 1947—the last year for which figures are available—the total population of the world was 2,320,000,000 according to a report by the statistical office of the United Nations.





Wings of the new Air Force long-range fighter sweep back at 35-deg. angle

HEAVYWEIGHT FOR LONG-RANGE BLOWS

From the tip of its needlelike nose to its tail, the hard-hitting XF-90 is 55 feet long. The cockpit is pressurized and has a pilot-ejection seat

Lockheed Aircraft photos

With the test pilot's appraisal—"she likes to fly"—initial air runs were completed for one of the largest fighter planes ever built. The U. S. Air Force's XF-90 is 55 feet long, has swept-back wings spanning 40 feet and weighs 26,000 pounds. Though a single seater, it is almost as heavy as the familiar 21-passenger DC-3 airline transport. The crest of the tail is approximately 15 feet above the ground. The Lockheed-built plane is designed to fly and fight deep within enemy territory, relying on speed and maneuverability to avoid trouble while seeking out such military targets as trains, tank and truck convoys and ammunition dumps. Every precaution was taken to make it as invulnerable as possible to battle damage. No performance figures were announced, but the plane is powered by two Westinghouse J-34 jet engines, each rated at 3000 pounds thrust. The plane's fuel supply alone weighs nearly as much as an F-80 Shooting Star.



Electronic Detector Finds Football Leaks

Football leaks as slow as $\frac{1}{100}$ ounce a year are detected by electronic inspection. A small quantity of Freon gas is put into the balls during inflation. Samples of air surrounding the ball are then sucked into the detector, and if there is any trace of the gas, a "peeping" sounds in headphones connected to the detector. The former system of allowing inflated balls to stand 10 days did not reveal very slow leaks and slowed production. The General Electric developed instrument is so sensitive that entire cases of footballs can be checked by passing the pistol-shaped detector over them.

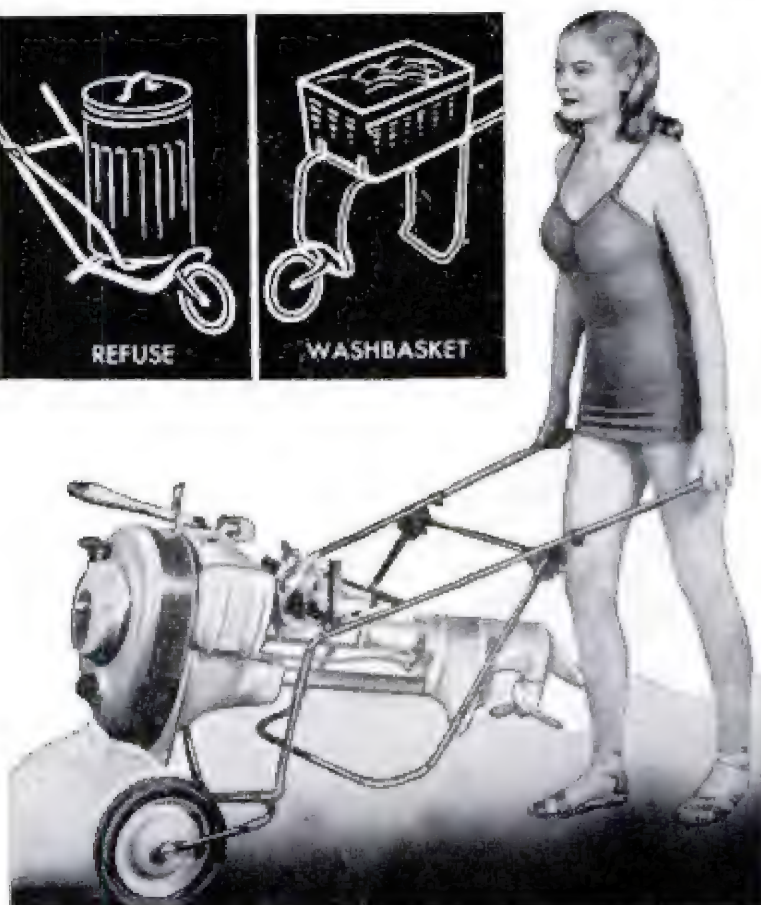
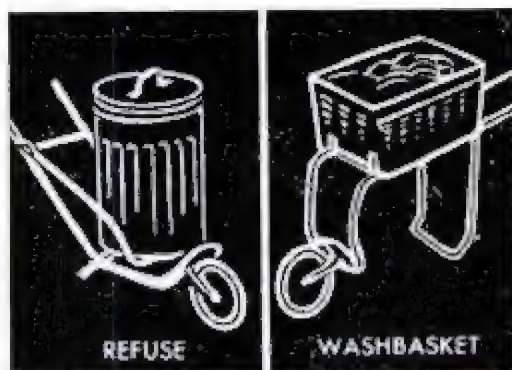


General Electric photo

Fresh Orange Juice Holds Flavor for Weeks

Fresh, unpasteurized orange juice, prepared by a process developed by the Department of Agriculture, can be shipped to distant markets without noticeable loss of flavor or vitamin-C content. The juice is kept cold in sealed cans. Because the oil of the peel causes off-flavor development, the new process involves careful reaming so none of this oil gets into the

juice. The prepared juice, after straining, is quickly chilled to 30 degrees and is held at this temperature until used. Even after more than two weeks, no noticeable loss in flavor or vitamin content has taken place.



Outboard-Motor Pushcart

Although primarily designed for hauling outboard motors, a one-wheel carrier doubles as a wheelbarrow for moving boxes, ice, wood and other bulky items. It will stand vertically on its handles and kick-stand, holding the motor upright for storage. Made of tubular steel, the carrier weighs only 15 pounds, yet will carry 100 pounds. With the motor in position, it will fit in a car trunk when the wheel is removed.

Marked Trolling Line

Fishermen can tell at a glance just how much line they have out with a new nylon trolling filament marked clearly every 100 feet. The marks are a series of bands two inches wide, dyed a highly visible blue. One band means 100 feet have been payed out; two bands represent 200 feet. The dye will not fade in fresh or salt water.



You

STEP RIGHT UP and get the scare of your lives!"

Americans respond to this call to the tune of \$100,000,000 which they spend every year on roller coasters, whips, "thunderbolts" and other devices calculated to make the rider think he is endangering his life. Actually, the whole thing is a happy fraud; these rides are safer than riding in an automobile.

It is a tribute to the ingenuity and careful planning of the designers of amusement-park rides that they can make you think you've had a sniff of death, yet only leave you mentally ruffled at the end of the ride.

Even in the roller coaster, famed for the terror it produces, the danger is not nearly so great as imagined. The roller coaster rarely beats 60 miles per hour, which is par for some motorists and peanuts for pilots. This speed is maintained only for short periods, and the average speed is considerably lower.

Hang on for your lives! That's just a gag for statistics show you are actually safer in the "death car" than in your home

can Scream in Safety

By Morris Chaklai and Allan Rechtschaffen

The trick is not in the speed but in the sudden change in acceleration. If you were driving along at 60 miles per hour in a car, you might feel entirely comfortable. But if you were driving at five miles per hour and one second later the speed were suddenly picked up to 60, you would feel the same way that you do in a roller coaster, except for the addition of sudden drops, sharp turns and breathtaking lifts.

It is the myriad of combinations of these dips, turns and lifts which makes each of the more than 200 roller coasters in the United States different.

For the most part, the coaster runs simply on gravity. The only part of the ride that is motor driven is a drag chain that pulls the cars to the top of the first incline. This is the highest point in the entire structure. Here the train is automatically disengaged from the drag chain and is on its own until the end of the ride, pro-

ceeding by momentum and gravity over humps which gradually decrease in size.

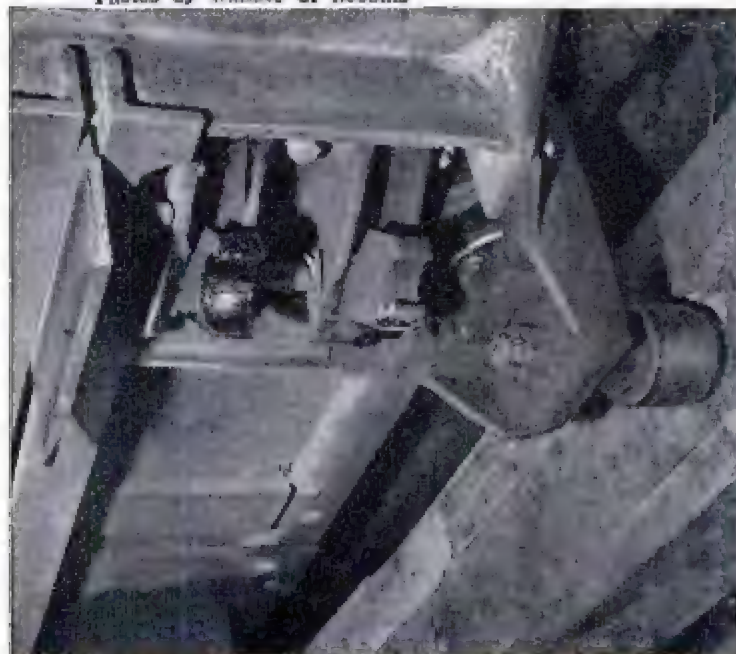
The first drop, which is usually in the neighborhood of 90 feet, is the one that sends your stomach up to clog your windpipe. Although the drops are rarely steeper than 45 degrees, the suddenness of changing direction makes people swear they have experienced perpendicular plunges.

Where drops are not so steep and along towards the end of the ride, excitement is maintained by various combinations of sharp banks and turns.

Much of the terror experienced on a coaster is caused by the groaning and shaking of the wooden structure while the cars are speeding over the tracks. This groaning and shaking is in itself a safety measure, because if the structure were built entirely rigid, the wood would have no "give" and would tend to crack under extreme tension.

A three-wheel construction of the car's

Safety devices under roller-coaster car include the two hooklike gears in center of photo below. Left gear engages drag chain to pull car and the other prevents car from slipping backward. Right, three-wheel construction holds the coaster to the track
Photos by Wallace C. Robbins





underpinning insures against the car flying off the track. Beside the conventional wheel, which rolls along the top of the wooden rail, a side friction wheel rolls along the side of the track, and a bottom friction wheel spins against the bottom of the track so the car cannot go anyplace but straight ahead.

Under each car, too, is the brake shoe, a keel-like steel shaft that slides between the plates of a squeeze brake on the track. Once a car has started dropping from the first peak, it cannot be stopped, except by one of these squeeze brakes located about the center of the ride, and another at the end of the ride. Very few coaster operators have ever seen the mid-brake used for emergency purposes.

The roller coaster, whether it is called the Cyclone, Tornado, Shooting Star or any other name, is the biggest money-maker in an amusement park. This is due not

Left, before the customers arrive, crews of mechanics make their daily rounds testing rides. Below, on the Wonder Wheel at New York's famed Coney Island the cars slide back and forth on tracks as wheel turns



only to its popularity, but to its capacity. The latter is a factor the layman usually does not consider, but which is of vital concern to the designer.

Two classic rides, often talked about but now practically extinct, are the Loop-the-Loop and the Bobsled. Tremendously popular, both of these lost money because they could not send more than one car on the track at one time. A roller coaster can put three cars on the track and have no "dead time" at all. Two trains will always be in motion while one is loading.

The Loop-the-Loop, built at a cost of \$400,000, was a brilliant feat of engineering. The car sped down an incline, sped up a hill which never straightened out but kept curving until the car was inverted and its occupants hanging upside down, and then on around the circle. So perfectly was this job accomplished that in an experiment, a glass of water placed in the car did not spill.

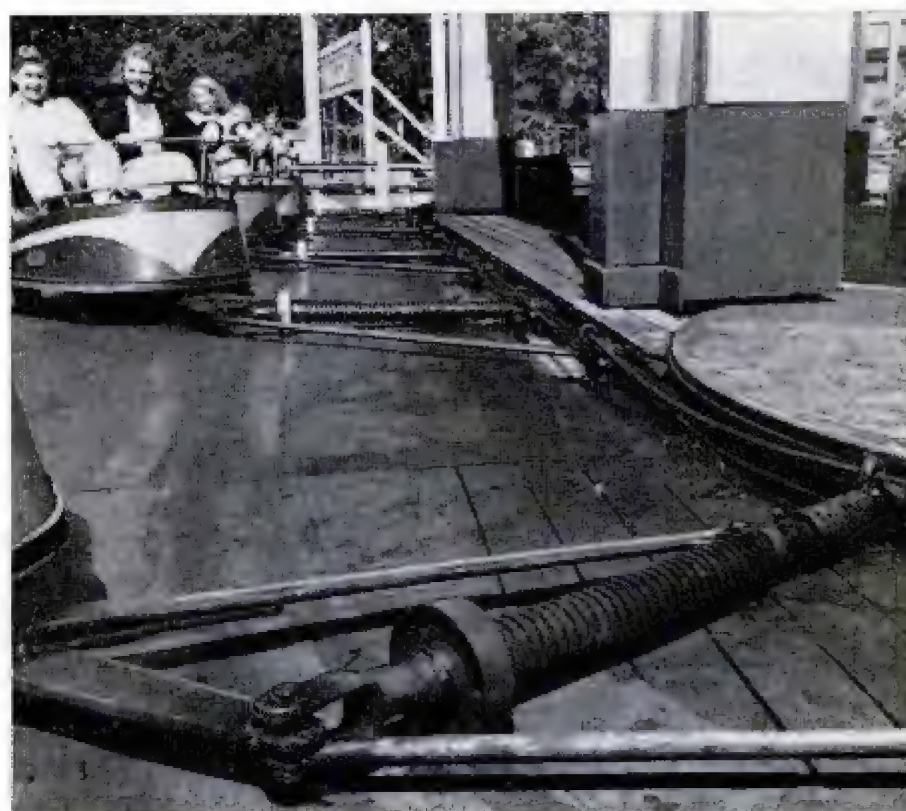
Testimony to the difficulty of combining apparent danger with actual safety in a ride is the fact that there are only five designers of roller coasters left in the U. S.

The achievements of these men seems even more amazing when it is considered that none of them is a graduate engineer. Each of them, in Horatio Alger fashion, has risen from nailing boards and running pipes to being an expert designer. It is through experience and rule-of-thumb methods that these men do their work. Though recognized engineers could probably figure out the mathematics and physics of a roller coaster, it is doubtful that they could integrate this technical knowledge with

(Continued to page 238)



This dizzy delight is the Gyro, one of the newest rides at Coney Island. The Gyro not only rotates on its axis but also turns through an angle of 60 degrees in both directions. Below, happy youngsters are protected by a safety cable running through the eyebolts on the steel arm of every car. If the main cable should snap, passengers would get harmless jolt





Above, concrete is sprayed on mesh to form lower half of pipe. Above, right, when lower half has set, wooden forms are built to support steel plates. Right, the completed pipe before inner forms have been removed

Concrete Sprayed in Trench Makes Irrigation Pipe

Concrete irrigation pipe is made as it is laid by spraying the concrete over curved forms right in the trench. The slow, laborious work of hauling and lifting heavy, precast concrete pipe is eliminated and savings of 50 percent are possible. The trench is excavated in a semicircular shape and lined with wire mesh. Concrete is sprayed on the mesh to a thickness of three inches. When this hardens, bracing timbers are placed three feet apart along the half pipe and curved steel plates mounted on them. Wire reinforcing mesh is added and



spraying is completed. Braces and steel plates are removed when the concrete hardens, leaving a smooth, jointless pipe. A crew of eight men can make 150 feet of pipe in a day by this method.



Fishline Unwinds off Reel For Casting Without Rod

Casting a line a long distance without a fishing rod is possible with a plastic ring that allows the cord to unwind smoothly. The weighted line is wound on the ring and then hurled across the water with the ring held at right angles to the direction of the throw. This permits the line to spin off the ring freely. Casts of 150 to 200 feet are made easily with a two-ounce weight on the end of the fishline. The six-ounce ring is hollow and will float if accidentally dropped in the water.

¶University of Illinois faculty members flew 300,000 passenger miles in school-owned planes last year in their assignments.



Sprayed Coating Reduces Glare

In summer when the heat and glare of the sun make work in bright factories difficult, the windows can be sprayed with a translucent green film. Then in late autumn the film can be peeled off by hand to permit more of the sun's rays to enter the windows. The coating, which can be applied with brush or spray, is a resin film which withstands water, soap and most window-cleaning compounds. If desired, it can be left on the glass indefinitely.



Chest-Pod for Reflex Camera

Photographers using reflex cameras can shoot off-the-camera flash shots without danger of dropping the camera when they wear a support that straps around the chest. The camera is attached to the chest plate by a universal joint that enables the photographer to tilt the camera in any direction. A web strap holds the breastplate in position. The complete support weighs only eight ounces and was invented by a Cincinnati newspaper photographer.

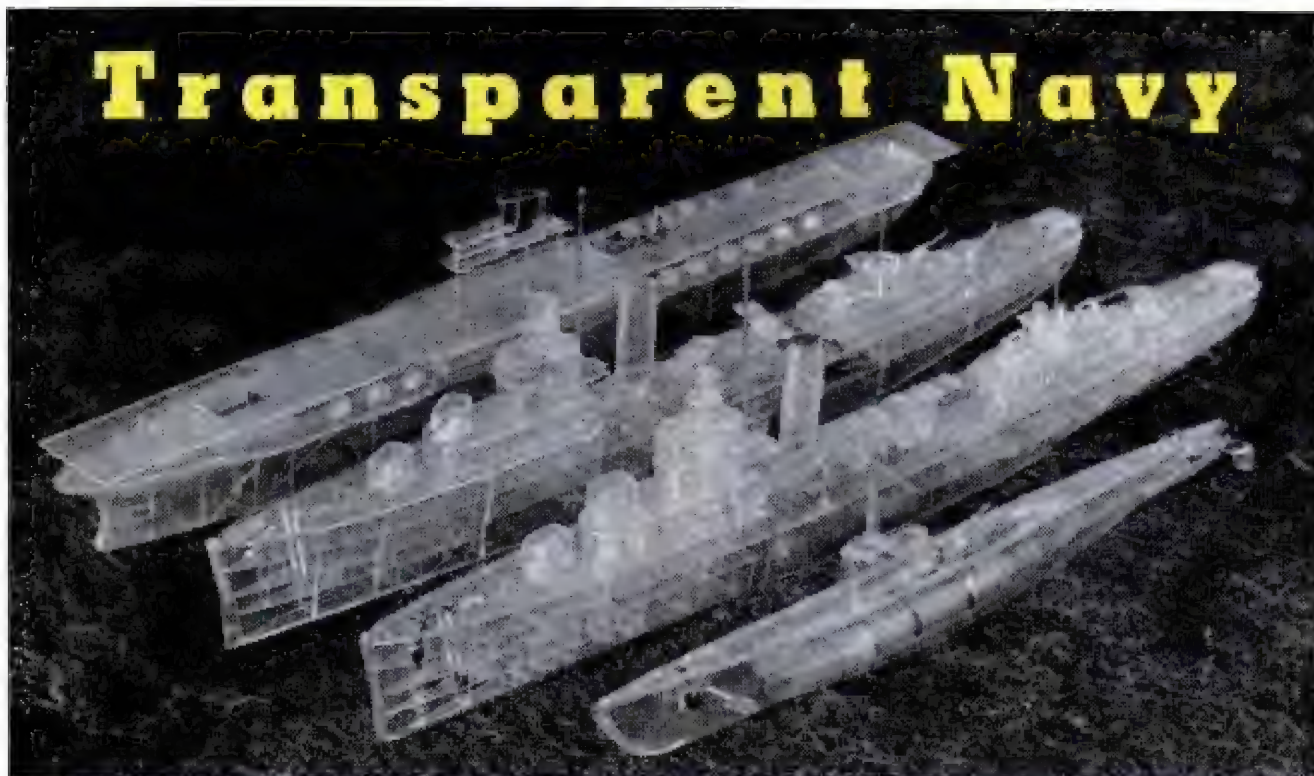
British Fire Fighters Ride Special Train to Blaze

Within five minutes after receiving an alarm, special fire-fighting trains maintained by the British Railways can be speeding to the blaze at 60 miles an hour. Organized to provide defense against fires that start along the right-of-way, the spe-

cial trains carry 8500 gallons of water, a supply of foam extinguishers, miles of fire hose and rations for the crew. The trains, manned by specially trained crews, are painted a bright red and are stationed at strategic spots along the lines.



Transparent Navy



Part of the transparent navy is shown here in "dry dock." Notice the bulkheads and other interior parts. The fleet is not built to the same scale throughout

Left, the model builder poses beside a 40-inch model of a Star sloop which he built for his "civilian" fleet. Even the sail of the plastic boat is transparent

Below, the wooden hull patterns in foreground were used to make the two molds in the rear. Richards is holding a submarine hull he formed with these molds



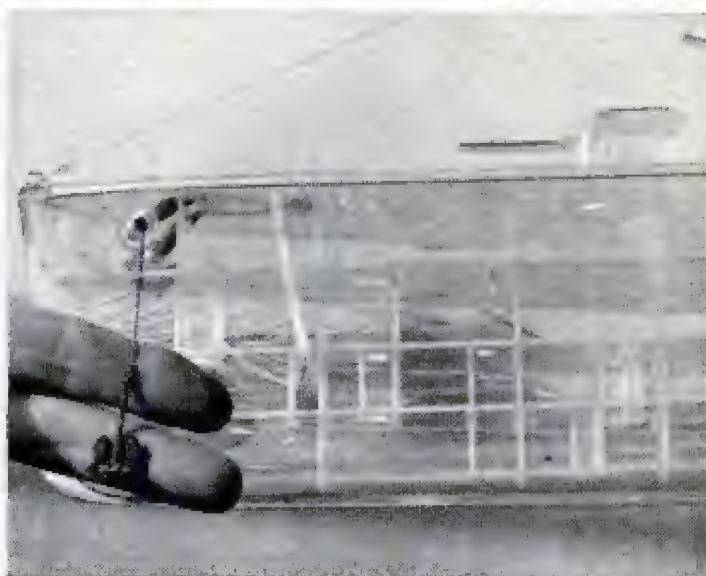
MODERN warships are complex, with a maze of bulkheads and passageways, but transparent scale models make the ships' construction as clear as the Plexiglas of which they are formed. John Richards of Long Beach, Calif., a former Navy man, makes these models to clarify the internal structure of ships to student designers and sailors.

From his back-yard workshop has come a score of craft built to scale and specifications. The fleet includes destroyers, submarines, an aircraft carrier and sailing yachts. The yachts will actually sail and the men-of-war cut through the water, powered by tiny electric motors. Davits and gun mounts swing, lights flash on port and starboard. The anchors can be hoisted and lowered.

Richards first makes a wooden model of the hull, then with this pattern he molds a plaster cast from which he makes interior and exterior molds of metal. The plastic is heated until pliant. It is then placed in the outer mold and the inner mold is forced into it with a jack-screw. He uses the same procedure for such small parts as lifeboats and gun turrets, except that a drill press provides pressure.



The model submarine gets under way powered by six flashlight batteries. Below, left, smaller pieces, such as this lifeboat, are pressed into a form with this drill press. Below, even the anchors move up and down





Airfield at Rock of Gibraltar Heads Out to Sea

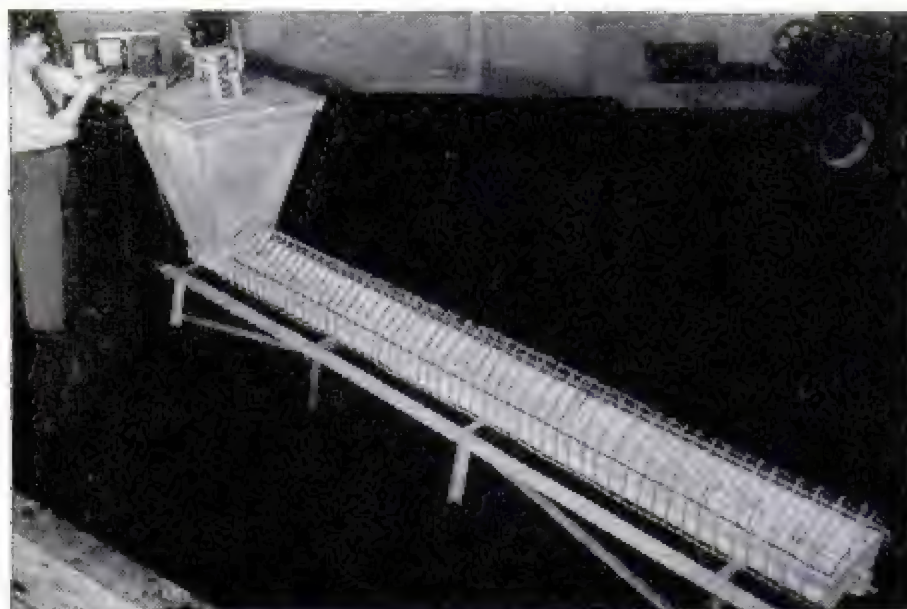
When the British forces on the Rock of Gibraltar needed an airfield during the war, there was only one way they could go to build it—out to sea. The Rock is much too small to hold a regulation airport. Instead, a 5400-foot air strip was built out

into the water at right angles to the causeway connecting the Rock to the Spanish mainland. Rock excavated during tunnel construction for Gibraltar's defenses provided the fill. The air strip is now used by British airlines.

Automat for Hens Shoves Mash Along Trough

Chickens now can eat at a cafeteria—an automatic poultry feeder that shoves the mash along a trough. Developed at Pennsylvania State College, the feeder can accommodate up to 200 hens. Feed hoppers of varying capacities hold from 300 to 500 pounds of mash. A time clock connected

with the electric lights in the pen regulates the feeder, turning it on for a few minutes every half hour. A conveyor chain carries feed down one side of the trough and back the other side. Building plans are available from the School of Agriculture, Pennsylvania State College, State College, Pa.



Arctic Adventure With a Camera

By C. J. Albrecht



Dressed for field work in the Arctic, the author wears woolen clothes and underclothes and caribou outer garments. Turret-head camera has three lenses

from his sensitive nose to the tips of his claws—you aren't likely to shoot with a camera. A rifle is a better weapon. I've shot with camera and rifle both to bring home bear steaks, photographs and my own shaking knees.

My business is lecturing on wildlife and procuring animal specimens to be mounted for museum displays. Currently I'm commissioned to design and mount displays for the Chicago Museum of Natural History. My "water hole" group there, more than 50 feet long, is the largest group ever mounted, containing numerous animals including five giraffes, five zebras, eight gazelles, two elands (large antelope), two rhinoceroses and one oryx.

In addition to my museum work, I present lectures on wildlife and travel, illustrating them with motion pictures and, in some cases, with stills. It is in preparing

PHOTOGRAPHY for thrills—that's one aspect of my business. In my six trips to the Arctic I've had some of the biggest thrills of my life, and brought back action photographs of those thrills.

When you see a giant Kodiak bear charging at you like a runaway freight train—an animal that measures almost nine feet

Photo shot at 50 yards shows Barren Land caribou on winter migration from Hudson Bay south to timberland



these pictures that I've had my biggest thrills, and a good many of them have come in the Arctic.

There's a mystery to the Arctic that brings a man back time and time again, despite 50-below temperatures and 35-mile-per-hour winds that whip your breath out of your lungs and leave an icicle inside your chest.

Arctic photography is an art in itself and requires a great deal more preparation than ordinary photography. I take both color and black and white, stills and motion pictures. That accounts for my excess baggage. For lecture material, I use 16-mm. motion in color with plenty of telephoto lens work on wildlife. Packing tripods through the Arctic is no fun, but is essential in making professionally smooth motion pictures.

The Arctic has as many types of weather as any area in the world, varying from rainy summers to blasts of 60 below in the winter. I winterize my equipment by removing all heavy lubricants and applying a special light oil. A hand-cranked motion camera is essential in case the motor fails to turn. When I'm ready for a winter expedition, I subject all my equipment to tests inside a freezer.

When I see a subject in the field that strikes me as new, interesting or different, I take it with plenty of footage. If the subject is put off until later, it's likely to become commonplace and I can't recapture my enthusiasm.

Take the case of the charging brown bear. I would have missed some of my



Top, giant Kodiak bear charges Albrecht. Moment later cameraman snatched up rifle and shot animal 12 feet away. Above, bear's footprint compared with rifle. Below, bear of similar size measures eight feet six inches





Author photographs wildlife from a distance, using a tripod-mounted Leica with cable release and 12-inch lens

most priceless shots if I had decided to wait for a better opportunity.

I spotted seven brown bears of different sizes across a stream and immediately set up with my telephoto lens. I was hard at work when suddenly out of the corner of my eye I noticed that the largest had crossed upstream and was coming toward me at a dead run. I turned toward him and snapped pictures as he bore down on my camera. He was mad clean through. At the last minute I dropped my camera, snatched up my rifle and fired a shot that struck him in the chest. He didn't even swerve. When he was 12 feet away, he reared up and I pumped a shot into the base of his skull. The slug went through his brain and he toppled over so close to

me that I could see every hair on his body.

Right here I'd like to clear up some misconceptions about the brown, or Kodiak, bear. It really is a huge animal, as some of my photographs show. The bear I described above left tracks in the sand, each about 17 inches long and 9 inches wide. By measuring the distance between them I found that his normal running stride was about six feet. He wasn't the record bear killed, but it was in this vicinity that a friend of mine did bring down the champion. This playful little monster, by actual measurement, was 9 feet high, 60 inches around the neck, almost 7 feet around the chest, 36 inches around the upper arm and weighed 1200 pounds. I mounted him in my new group at the museum.

Albrecht took this photo of the northern lights over a trapper's cabin when the temperature was 30 below. The picture was taken at midnight with a 30-second exposure on Super XX film with a lens opening of f:4.5





An 80-year-old buckskin maker poses for Albrecht's camera with the ax blade she uses as a scraper on the bull-moose hide behind her. Below, author explained his exposure meter to these timid Eskimos to gain their confidence, then asked them to pose for this picture



In the field I either stalk my subject or work from a blind. While stalking I frequently carry the camera mounted on the tripod, ready for anything that may turn up. I go the limit on telephoto lenses—the larger the better. My choices are 7, 12 and 20-inch jobs. Heavy? Yes, but they bring in the pictures.

Blinds of branches and grass are constructed to prevent animals from detecting motion. They may be open on top and back but must block out actions in silhouette. In addition, the photographer's movements must be slow and deliberate.

Clothing depends upon the season, varying from hip boots and head nets to wool underwear, eider-down jackets, parkas and snowshoes. Proper clothing played a big part in saving my life during a storm in the Arctic.

We were aboard a 117-foot, two-masted schooner and that particular day we crossed and recrossed the Arctic Circle six times. Without warning, a heavy wind broke off our rudder and its four-inch iron support. We were adrift in heavy Arctic seas.

Our first thought was to find some means of navigating our boat, so we rigged up a jury rudder that helped a little. We toppled through the waves for hours. After dark that night we crashed between two of the Diomed Islands, damaging the boat even further. Eventually we made our way to Teller, Alaska, just before the wind changed, or we would have been blown back out to face the sea again. Fortunately, I was dressed warm enough to survive the hardships of this trip.

On my field expeditions today I carry much more equipment than I did on my first trip to Alaska-Siberia in 1913, but it weighs much less. In those days I used a heavy Pathe 35-mm. camera with tripod, a combination



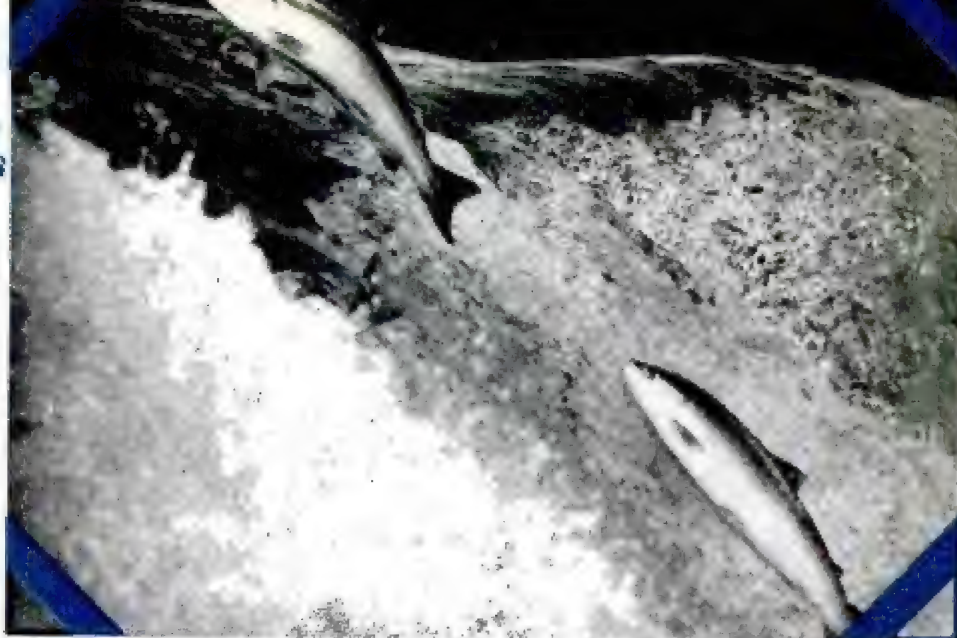
that tipped the scales at 100 pounds. The smallest automatic, a French Aeroscope, was a heavy job with four air-compression tanks that were filled with a bicycle pump and controlled with a throttle like a steam engine. This came in handy when I was chasing walrus and polar bear.

If I were limited to one motion camera for any and all field work my choice would be a Victor 16-mm. Model 5. In my opinion, it is the most versatile and adaptable camera I have handled. It has a fast-sighting view finder for snap-shooting, such as birds in flight or fleet animals, and still has a critical parallax compensation for close work. It is adaptable to anything from $\frac{1}{2}$ inch to a 20-inch lens and it has a button release, operated like a trumpet key, that can be used even if the photographer's hands are covered with a pair of the heaviest Arctic mittens.

I have found the American .50-caliber ammunition boxes to be most useful for packing and carrying film and cameras. With balsa wood, velvet and a little ingenuity anyone can build a good camera case out of one of these boxes. One container will hold two dozen 100-foot rolls of 16-mm. film or an assortment of rolls and cut film. In the field the cases can be used for seats on the damp ground.

One piece of equipment that is vital when trying for photographs of large game is a high-powered rifle. You

(Continued to page 232)



Exposure of only 1/1000 second yielded print of salmon leaping falls



By playing a mouth organ to this cautious willow ptarmigan, Albrecht stalked close enough to snap a portrait. Below, trappers log in wood supply for winter. Arctic is rich ground for interesting camera shots





Model Engine Scoots Scooter

Riding a sidewalk scooter powered by a model-airplane engine, a Los Angeles hobbyist breezes past pedestrians. Between model meets the amateur mechanic mounts the little $1\frac{1}{2}$ -horsepower engine on the front of the scooter. The inventor uses a standard model-airplane propeller to provide the pulling power. The little vehicle has a one-pint fuel tank.

Modern Tokyo Office Building

With its lower floors occupied by an American-style department store, a proposed nine-story office building in Tokyo will have a total of 3,600,000 square feet of floor space. The building will be constructed by the International Club of that city. The top floor will be used as a church.



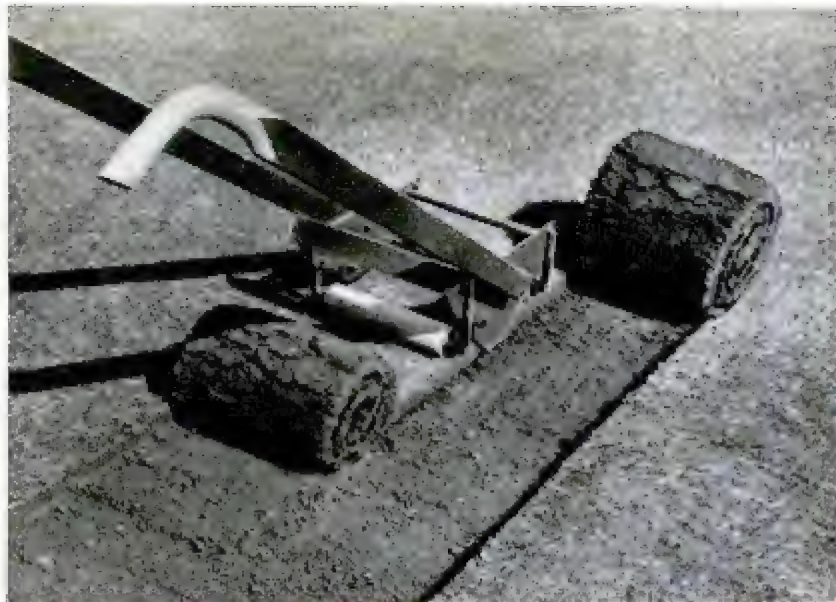
Tubes Made Punctureproof By Sealing Compound

Regular automobile tubes are made punctureproof by a sealing compound that is pumped into the tube through the valve stem. Produced in England, the compound, forced in by air pressure, coats the inner walls of the tube, making it self-sealing when punctured by nails or sharp objects.

Clamp Holds Drills for Sharpening

Small drills are sharpened accurately in a hand-held clamp that guides an oilstone as it is stroked against the point. The drill is inserted in a bushing of the correct size and held in a chuck with the point protruding through an angled surface. The oilstone then is rubbed against one lip of the drill until it is flush with the surface. To sharpen the other lip, the drill is rotated one half turn. The sharpening kit includes the holder, 20 bushings to accommodate drill sizes from 41 to 60 inclusive and an oilstone.





Sod Cutter Slices Turf Into Even Strips

Sod is removed from lawns so evenly with a new sod cutter that when it is replaced there is almost no sign that the lawn was disturbed. Consisting of a double-edge cutting blade that can be adjusted to depths from 1 to 3½ inches, the cutter is pushed

along on two rollers. To start cutting, the operator presses down on the rear of the cutter with his foot until the blade is forced into the sod. Then, by pushing on the handles, he slices the turf into even strips of sod that can be rolled up without damage.

Truck Tracks

Crawler-type tracks for trucks help pull the heaviest loads through deep snow, mud or sand. The tracks, which have been used by the armed forces and approved by U. S. Army Engineers, will fit single or tandem-axle trucks equipped with standard dual tires. It only takes about 10 minutes to mount the tracks. The pads are made of drop-forged steel alloy and connected by a cadmium-plated steel chain.



Drive-In Theaters To Get Heaters

Drive-in theaters will soon provide their customers with heat as well as sight and sound. A heater-speaker unit, designed to hang inside the car window, has an enclosed heating coil that keeps the car temperature at a comfortable level. With these heaters, drive-in operators expect to add at least two months to their seasons.

Mountain-Top Lighthouse



By Harriet McIntosh

DAWN WAS BREAKING over the Arizona desert as C.A.A. maintenance technician A. H. Lee killed his third rattler. Atop Picacho Peak, which jugged 1800 feet from the desert floor, the airways flasher beacon winked off for the day. Lee noticed it with satisfaction, nudged the snake from the path and continued up the cactus-spiked trail toward the big light.

From coast to coast, lights on mountain peaks are the road maps of night-darkened skyways for pilots. They must be as failure-proof as precision equipment can make

C.A.A. maintenance technician A. H. Lee must polish and inspect the beacon's lamp housing each month



them. Once installed they become subject to the vigilance of the maintenance men in C.A.A.'s Airways Communications.

Like Lee, these men are in their thirties. After passing rigid tests for a civil-service rating, they are assigned an area within one of the country's seven air communications regions, where they watch and maintain up to 25 beacons. They acquire a panel truck, repair tools and the technique of a mountain goat. Each light is checked once a month; some more frequently.

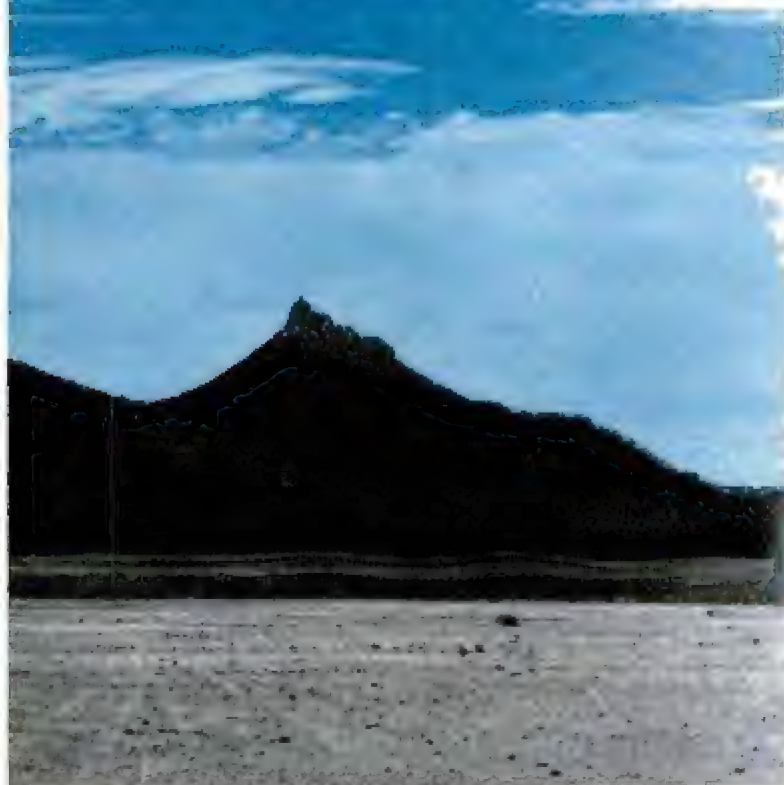
Though assignments may include checking airport lighting and some power substations, most time is spent on the giant flight route lamps, spaced in remote areas some 20 miles apart. Close-up, the lamps resemble big eggs with one end dyed red or green. Most common are "obstruction blinkers," red or white warning lights that wink atop towers or sharp peaks near landing areas. Least understood is the "code light," a flasher beacon which blinks the number of miles from the last point of departure. Many beacons, like Picacho, sit on isolated pinnacles miles from any road. Lying between Phoenix and Tucson, Picacho is a focal point for night pilots who first spot its code 40 miles away. It tells them they are 60 miles out of Phoenix, thrumming east from Los Angeles.

Lee knows when he leaves his truck at

Tender

On the highest pinnacle of Picacho Peak, left, sits one of C.A.A.'s many beacons marking the airways for night pilots. Servicing them is a tough, full-time job for men who must be agile as well as able

Picacho's code blinker rests on a fixed mount on the platform of a 40-foot tower. Spikes on the tower rail discourage buzzards from nesting in the beacon's light path, saving technician Lee extra work



the base of the peak that six hours will elapse before he returns from the rugged trek.

Picacho's beacon is a Code Type 'E,' consisting of a 40-foot tower topped by a stationary fixture holding a 500-watt bulb. Like most beacons it has an emergency bulb fixed at right angles to the one in use. In case of failure, a small motor swings the used bulb aside and snaps the emergency bulb in place. Picacho's biggest asset is power-line electricity. Many isolated beacons have gasoline generators, involving portage of fuel—no cherished task.

No rule says Lee must work an odd shift, but he prefers predawn rattlesnakes to blistering heat, so his day begins at 3:30 a.m., when he drives his truck out of Phoenix toward





Rugged trail to the beacon is three miles and almost vertical. C.C.C. boys built it and strung the guide ropes

the foot of Picacho Peak, climbs to the summit and goes to work.

The light is controlled by a clock which sets it winking code at sunset and snaps it off at dawn. After checking the clock at the tower base, Lee climbs to the light, which he cleans and inspects.

During summer, the tower is a magnet for lightning. Maintenance men are used to midnight calls which send them rocketing through lashing rain to trace a beacon failure. On such a mission, Lee once brushed a mountain lion that was sleeping under a ledge, and raised a mean snarl from the beast. "I quaked for three days," he recalls.

Beacons like Picacho, by their very iso-

lation, seem a challenge to vandals who may drive 50 miles and hike 3 just to shoot rifle bullets at the power line insulators or destroy water supplies. Maintenance men look for such damage, and also for birds who love to nest near the bright beam, blocking its path. One man had to climb an 80-foot tower, wedge himself into a railing and blitz a nest while battling at the outraged crows he was displacing.

No airways maintenance technician considers his job worth chest-thumping. But few men love their work as well, despite the modest salary. "I can't explain it," says Lee. "I just know that when I'm driving home and pass a couple of beacons flashing in good order, I feel good."

Torque-type clock turns beacon on at sunset, off at dawn, automatically adjusting to seasonal variation. Lee adjusts it, left, then oils the code cam, right. As cam turns, it makes contact for a long flash, two shorts



Plastic Insulation Is Lightest Solid

Twenty times lighter than the fluffy meringue on a lemon pie, a plastic foam insulating material is believed to be the world's lightest solid. Developed by a Westinghouse chemist, the new material is being tested as insulation for refrigerators. It is produced by baking a molasseslike synthetic resin at about 350 degrees, causing it to expand to 100 times its original volume. Thousands of gas bubbles are trapped in the foam when it solidifies. The material can be shipped in its liquid



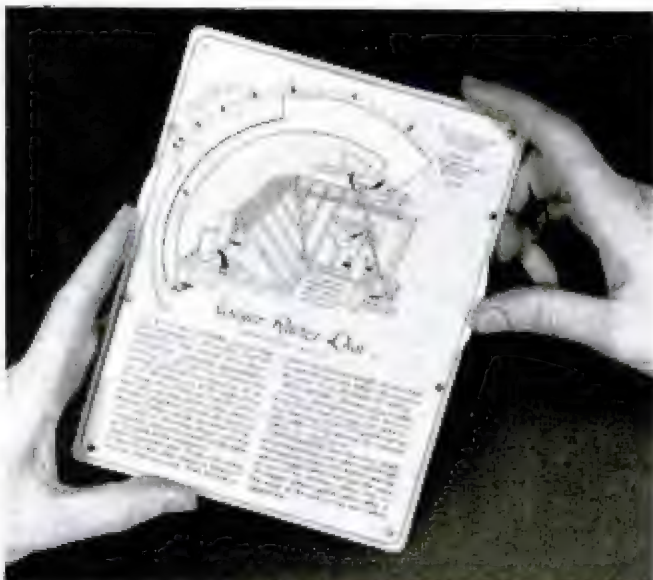
form and expanded at the place where it is to be used, easing the problem of shipping and storage.



Car for Errands Carries Three

Cheap transportation is provided by a small coupe designed to serve as the extra car in the family. Just right for the trip to the shopping district, school or neighborhood theater, the car has a top speed of 35 miles an hour and averages from 45 to 60 miles to the gallon. It has an automatic

clutch and transmission. A 7½-horsepower air-cooled engine is mounted in the rear. The front end includes a large luggage compartment. The body is formed of pressed wood and three adults can ride comfortably in the single seat. Standard equipment includes hydraulic brakes, electric starter, automatic choke, safety-glass windshield and coil springs.



Roof Calculator

By merely setting two dials on a new calculating instrument a carpenter can determine the lengths and cuts of all roof rafters. The Vinylite-plastic instrument shows a picture of a roof. With the dials properly set, arrows on the picture point out the exact readings for the lengths and angles of the various rafters. The calculator is small enough to fit into a coat pocket, brief case or toolbox.

¶ An estimated 250,000 model-railroad fans in the United States operate enough miniature trackage to reach eight times across the country, and spend \$5,000,000 annually on their hobby.

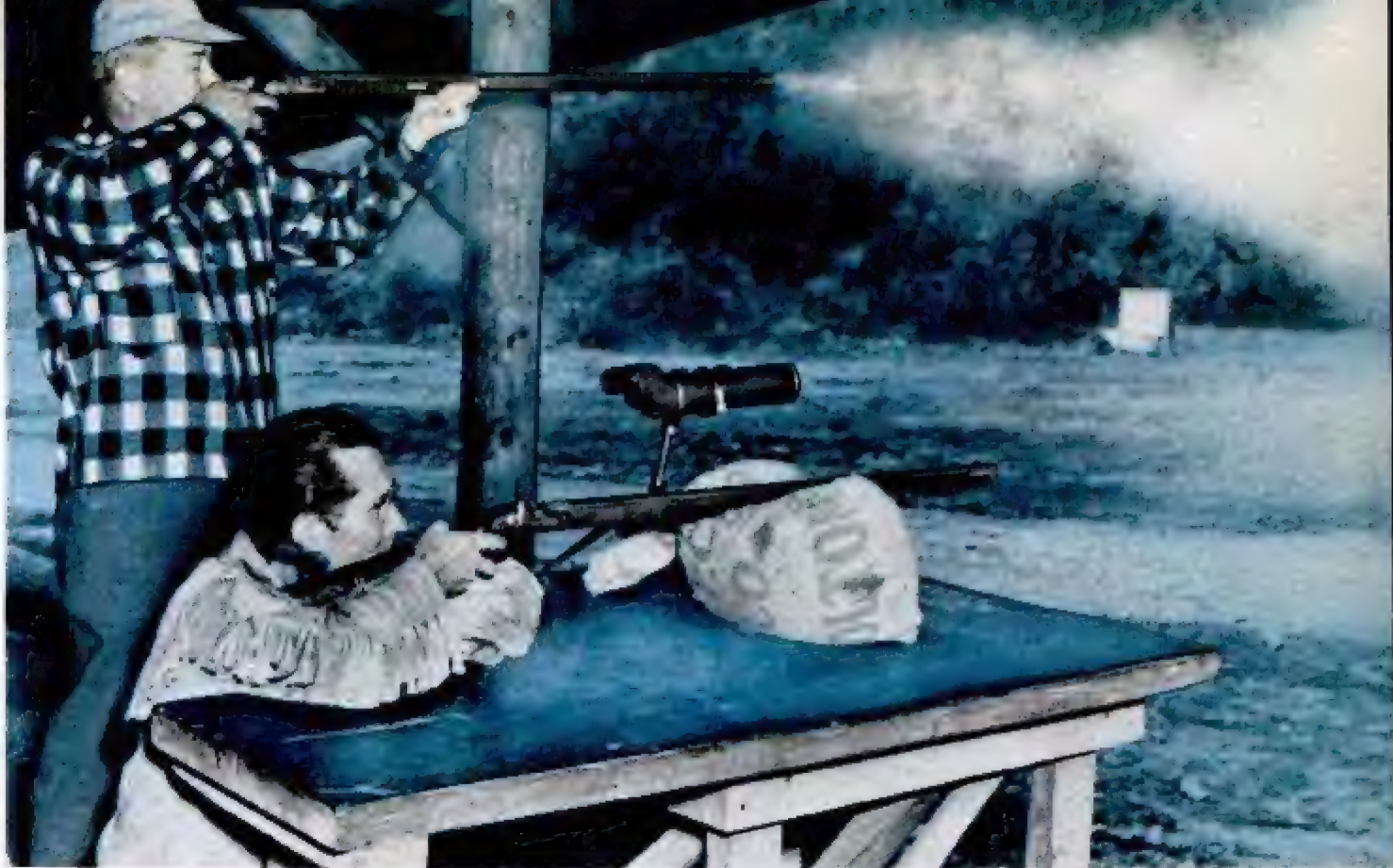


Daniel Boones on the Rifle Range



Modern frontiersmen line up for a volley with their muzzle-loaders. Above are match rifle and hunting rifle with equipment for each





Two recognized firing positions during the matches are the offhand or standing and the bench rest or sitting

By Andrew Hamilton

ON LABOR DAY week end, approximately 600 "gunbugs" from all parts of the United States will gather in Friendship, Ind., (55 miles southwest of Cincinnati) for one of America's unique sporting events—the national matches of the National Muzzle Loading Rifle Association.

Peeking over their shoulders for five days will be more than 3000 pop-eyed spectators. They'll see shooters ranging in age from 12 to 80 years. They'll smack their lips over delicious, home-cooked food prepared by ladies of a nearby church.

And next year—maybe—some of the on-lookers themselves will be up on the firing line banging away.

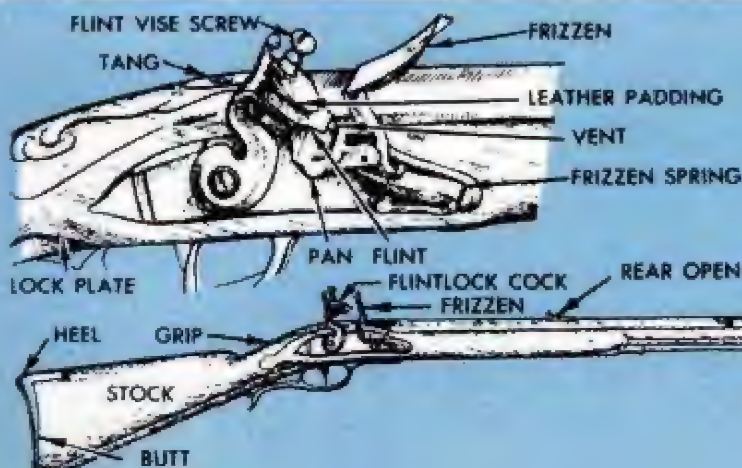
Chances are it won't be the food that will make converts for this all-American sport. It will be the muzzle-loading rifle—a slim, straight-shooting beauty as rich in tradi-

tion and history as it is in grace and charm.

Defined by the Official Range Rules and Regulations of the National Muzzle Loading Rifle Association, a muzzle-loader is "any gun that repellent charge and patched ball or patched bullet is loaded in the muzzle of the gun and ignition at the breech is by cap or flint."

"Muzzle-loaders?" someone is bound to wisecrack. "I thought those things went out of style with Daniel Boone."

Actually, the muzzle-loading rifle has never been abandoned here in the United States. In some of the remoter regions of Kentucky, Tennessee, Ohio and Indiana, the muzzle-loader still provides meat for the table and guards the home against intruders. And within the past 16 years, the match shooting of muzzle-loaders has developed into a national sport.



Here are the principal parts of a typical muzzle-loader. To meet requirements, the rifle must be loaded with a patched ball from the muzzle and ignited at breech by cap or flint

Ever heft a muzzle-loading rifle—a Kentucky for example?

They're long—up to 60 inches—but light and well-balanced. At the breech is an old-style flintlock or percussion-cap mechanism. The stock is almost always made of light brown, curly maple wood, inlaid with brass or silver. The octagonal barrel, up to fifty inches long, has from five to eight grooves in the bore.

Put it to your shoulder. The stock angles sharply down and the butt fits into your upper arm instead of your shoulder. Sight down the barrel and slowly squeeze the trigger. There's a blinding, sizzling flash of black powder and the kick and roar of the explosion.

A few muzzle-loading pistols and shotguns exist in the United States today. But the typical representative of all muzzle-loading weapons is the Kentucky rifle.

It was this rifle which was originated in the United States and brought to its highest perfection here. Around 1720, a group of German, Dutch and Swiss craftsmen settled in Lancaster County, Pa., and began to make the gun we know today as the Kentucky rifle.

These early artisans didn't copy European guns—heavy, clumsy, short-barrel, large-caliber weapons. They made an entirely new gun, adapted to the woods and mountains of North America. To give greater accuracy, they lengthened the barrel. To save on powder and lead, they reduced the inside diameter of the barrel from a European caliber average of .50 to one inch to the Kentucky rifle's .40 to .50. As a matter of fact, the Kentucky rifle was 125 years ahead of its time. The United States Army didn't reduce the caliber of its rifles to .45 until 1873, subsequently reducing it even further to .30.

It's been said that the Kentucky rifle "cleared a wilderness and made a new nation." Lewis and Clark's men carried these rifles when they explored the Oregon Trail. One of the first groups to volunteer for George Washington's ragged army in 1775 was a regiment from York, Pa., armed with muzzle-loaders. Andrew Jackson's 2000 frontiersmen at the Battle of New Orleans held off 12,000 British redcoats and helped to win the War of 1812.

Although there never was a time in the last 200 years when you couldn't get up an impromptu match somewhere in the Middle West, muzzle-loading rifle shooting wasn't formally organized as a sport until George Washington's birthday, appropriately enough, in 1933.

It was a cold, blustery day in Portsmouth, Ohio, but 67 gunbugs brought their Kentucky rifles and gathered for a muzzle-loading rifle match. That evening some of

I



the sportsmen sat around a fire and talked.

By the time the snapping logs turned to embers, they had hammered into shape the outlines of the National Muzzle Loading Rifle Association. Today there are 6000 regular, paid-up members of the organization in the United States, Canada, Mexico, the Canal Zone, the Hawaiian Islands, Alaska and Europe.

The association is nonprofit and exists solely to perpetuate the craftsmanship of fine gunmaking and to preserve the American heritage of skilled marksmanship.

If shooting a muzzle-loading rifle appeals to you as an interesting hobby and sport, here are the steps you may take to become a "muzzler":

1. Join the National Muzzle Loading Rifle Association. (Address: P. O. Box 1150, Portsmouth, Ohio.) It will cost you \$2 for an annual membership or \$25 for a life membership. You'll receive a subscription to the organization's monthly magazine, "Muzzle Blasts." It contains 24 to 32 pages of fascinating shoptalk about all types of muzzle-loading guns.

2. Acquire a gun. This will require some initiative on your part. First, rummage through the family heirlooms. There may be a muzzle-loader stored away in an attic trunk, out in the smokehouse or down in the cellar. Second, try the secondhand stores in your community. Guns are getting harder to find, but sometimes you will run across one and can buy it cheap. Third, read the advertisements in "Muzzle Blasts" and other gun magazines. A number of dealers throughout the country offer muzzle-loaders for sale. For a gun in fair condition, an average price is \$35 to \$50.

Some muzzlers who are also expert



1. First step in loading is to measure a charge of black powder out of the leather flask or powder horn

2. Cloth is wet with the tongue and wrapped around ball. Load is tamped into muzzle and cloth trimmed

3. Next the wrapped ball is driven very carefully down the length of the barrel with a hickory ramrod

4. Muzzleer primes the flintlock with a few grains of black powder which will ignite the main charge

5. Pulling the trigger produces sizzling flash and then roar of explosion. Cloth around ball cleans bore



Some muzzleers add modern ingenuity to the shooting of old-time rifles. This marksman designed a crank-handled device for measuring an accurate amount of black powder into the rifle muzzle for each charge

craftsmen follow a hobby of making duplicates of famous old-time rifles—lock, stock and barrel. Others build muzzle-loaders with emphasis on getting highest accuracy out of them—heavy-barreled jobs that weigh nearly 50 pounds. Still others are bitten by the collecting bug and own up to 60 or 70 muzzle-loading weapons.

3. Have the gun carefully checked by a competent gunsmith. This is especially important with rifles that have been stored away for a number of years. A cracked barrel or a defective breech could mean serious injury or death.

4. If a gun needs repairs or alterations, you have a choice of working on it yourself or having a good gunsmith fix it. You can't do much about a new barrel unless you are an expert machinist. You'd better count on buying that part for \$20 to \$35, depending on weight. But if you fancy yourself an amateur mechanic, you may be able to fix the breech, lock and trigger mechanism. Sometimes all you'll need is a new, sharp flint or a squirt of oil.

5. When the gun has been repaired or remodeled, be sure that it is test-fired before putting it to your shoulder. To test-fire a gun, mount it securely in clamps or tie it to a tree. Then place a string around the trigger, stand some distance away and pull. Test it several times before shooting it from the shoulder.

6. In addition to the gun, you'll need some other equipment. For example, a bullet mold, some soft lead for making bullets, a supply of black powder, extra flints or percussion caps, a hickory ramrod and some linen cloth. The black powder is carried in a powder horn or flask. Some of the other equipment is carried in a leather "pos- sible bag." Many muzzleers prefer to make the last two items themselves.

7. When you're ready to shoot, you'll want to review the

(Continued to page 234)

Off or on the firing line muzzleers are a friendly, talkative group. These modern Daniel Boones discuss their hobby as they prepare rifles for their turn on the line. Note elaborate equipment some have made





Pressurized Crate Protects Jets From Damage During Shipment

Jet engines, completed for delivery, now are packaged in torpedolike cylinders that are pressurized to protect the jets from humid air. The cylinder is mounted on rubber shock absorbers inside a mobile aluminum crate. The crate rides on a four-wheel dolly which also is mounted on rubber to prevent damage in shipment and storage. The engines are packaged by the Firestone Tire and Rubber Company. The Navy has placed a large production order for the pressurized package.

Quick-Acting C-Clamp

Eliminating the slow and tedious process of spinning the C-clamp closed, a new push-pull clamp is quickly set to position by sliding the pressure shaft to any position. When the handle is turned, an eccentric spline arrangement instantly locks the pressure bar and pressure screw as one unit for applying pressure to the foot. To release the clamp, you unscrew the handle slightly and the locking device releases, allowing the pressure bar to be pulled back without additional turning.

Popular Mechanics provides two sources of further information concerning articles published in each issue: the WHERE-TO-BUY-IT INDEX, starting on page 10, and the WHERE-TO-FIND-IT INDEX, which is available without charge from Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois.



Life Preserver Built Into Jacket

Fishermen and boating enthusiasts need no life preserver when they wear a new sports jacket. Built into the jacket is a Vinylite air tube that can be quickly inflated by mouth. Uninflated, the garment looks like an ordinary jacket. If the wearer finds himself in the water, he turns a valve cap on the left side of the collar and blows into the valve. The preserver extends from either side of the chest around the neck. Air is retained by turning the valve cap clockwise. The jacket is available in sizes for men, women and children.





Days before the twisting, hazardous race, the drivers gather for practice spins

WHICH automobile race in the United States pays the highest cash prize per mile?

The answer is the annual Pikes Peak Hill Climb, held each Labor Day on the slopes of the famous mountain near Colorado Springs, Colo. Probably of more interest than prizes is the fact that the Peak race is one of the most grueling tests of man and machine to be found.

The highway to the summit of Pikes Peak is a beautiful gravel boulevard offering safety for the sightseeing motorist, but presenting a challenge of the top order to the racing driver. More than 165 turns,

curves and hairpin corners line the course, and in many places a bit of careless driving would send the participant plunging over an embankment or spinning off into the thick underbrush.

Old Man Weather occasionally attends the event along with the thousands of spectators who line the 12 miles of roadway, and on these days the driver may have the odd experience of starting the race in the warm autumn sunshine of the Labor Day morning and finishing in a storm of rain, hail or snow that can envelop the summit so suddenly at the 14,110-foot elevation.

Mechanics who groom the cars for this

Contestant brakes around a curve below the timber line, then guns on up the slope in his race against time



Auto Race to the Clouds

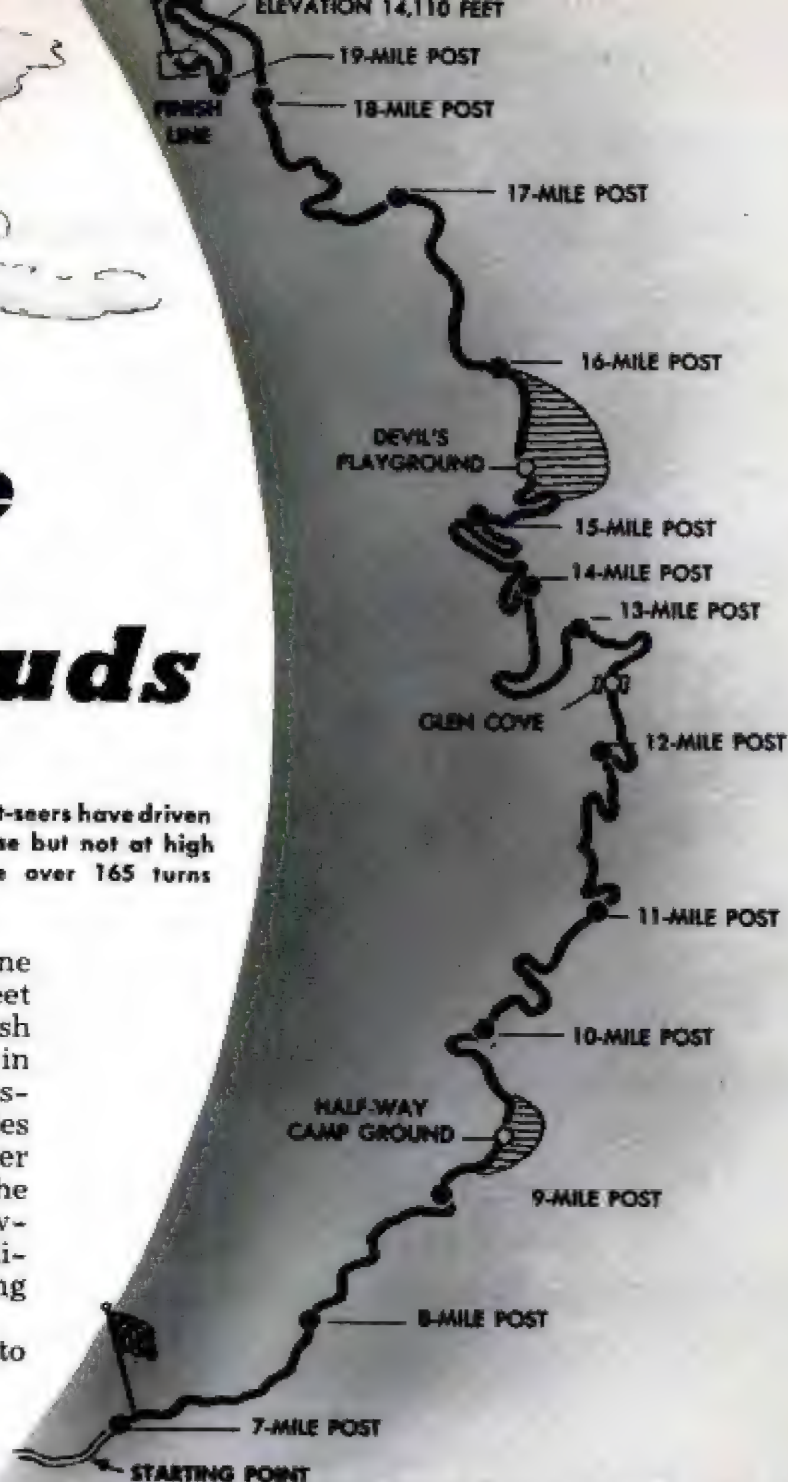
By
O. L. WOOLLEY

Thousands of sight-seers have driven this twisting course but not at high speed. There are over 165 turns

contest have far more than a fast machine to produce. The variation of over 5000 feet in elevation between the start and finish constitutes an extremely tough problem in carburetion and cooling systems. Obviously, a carburetor adjustment that provides the proper fuel-to-air ratio at the lower altitudes will not be satisfactory in the rarefied atmosphere near the top. The lowered boiling point of liquids at high altitudes demands that cooling and lubricating systems operate efficiently.

The car must also handle perfectly to

Spectators line roadway at 13,000-foot level, watching Al Rogers, 1948 winner, throw his car into controlled skid to negotiate a turn





Louis Unser, who holds the course record, thunders around a corner just below the 13-mile post. Below, driver heads into a switchback high on the slopes of the Peak. Note the twisting roadway far below



Racing turns at Indianapolis are a snap compared to these. The course snakes more than 12 miles to summit

permit the driver to maintain complete command as he throws the machine into one controlled skid after another. In dozens of places the driver must shift to a lower gear for rapid acceleration out of a climbing hairpin corner, and clutch and transmission assemblies must absorb a brutal pounding. The power plants follow conventional racing practices with multiple carburetion, overhead camshafts and, in some instances, dual ignition. The majority of the drivers favor the special racing engines, such as the Offenhauser and Miller, while a few have gone in for the complete custom-built car as exemplified by the Alfa-Romeo or Maserati.

Strangely enough, the tires used for this race are stock tires of the type that may be purchased for a passenger car. For many years, tire manufacturers have worked closely with the drivers and the result has been a distinct improvement in conventional tire design and construction. Engineers report that the abuse and wear given a tire in the Peak race exceeds the wear that would occur from many thousands of miles of passenger-car service. The tires are altered only in one respect—deep grooves are cut across the tread surface to provide a more positive gripping action.

The Pikes Peak Hill Climb was first held in 1916 and has been run annually since, except for the war years. Through the years the race has consistently attracted thousands of racing enthusiasts. From many points the fan may look down from a lofty seat and follow the progress of the racers as they thunder over the course, climbing from the pine-covered hills of the starting point to the timber line where vegetation can no longer exist, and then upward to the top of the peak that Lt.





Driver roars past the finish line atop Pikes Peak. Box among rocks holds light for photoelectric timer

Zebulon Pike vowed in 1806, "No human being can ascend its pinnacle."

Many of the famous names of racing have appeared on the hill-climb entry sheets, including "Cannonball" Baker, Red Shafer, Joel Thorne and Russ Snowberger of Indianapolis fame. However, the majority of winners have been men familiar with the course. Familiarity with the twisting road is a great asset to high-speed driving.

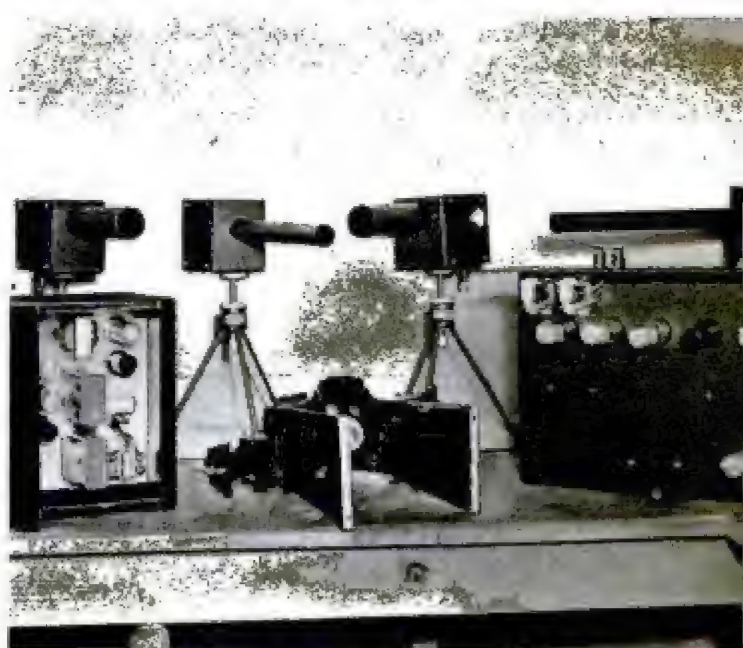
For many years a driving duel has been waged between Louis Unser, eight-time winner, and Al Rogers, winner of the 1940 and 1948 events. Both are long-time residents of Colorado and are familiar with every rock and tree along the course.

Unser drives an eight-cylinder Maserati, which is brought from the eastern tracks each year for this event. Rogers' car is a special hill-climb job, the result of many years of work and experimentation by Joe Coniff, the owner. It has an Offenhauser racing engine of 225 horsepower. The car resembles a typical track racer in outward appearance, although designed solely for the Peak race.

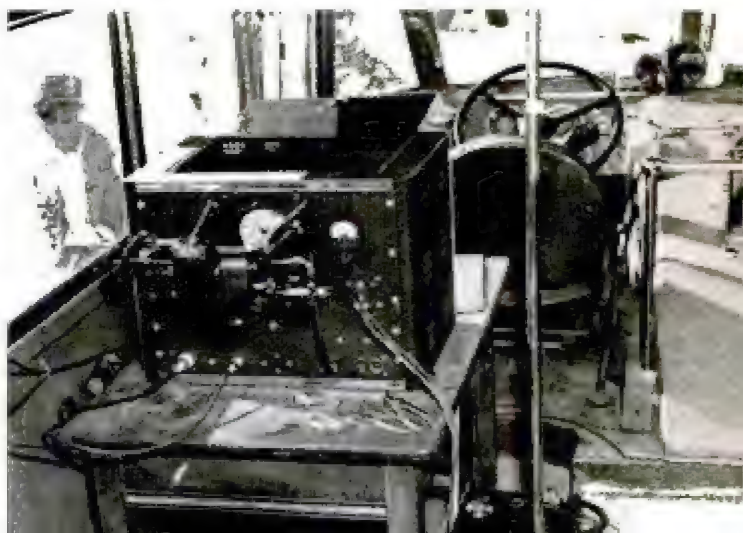
An entry that aroused interest in the last race was that of William Milliken of Williamsville, N. Y. This car was originally designed for the Indianapolis track and features a four-wheel drive powered with a Miller racing engine. Due to mechanical difficulties the car was forced from the 1948 race, but some fans feel that the four-wheel drive may give a better account of itself in future events by utilizing the added traction for quick getaway in sharp corners.

Another Indianapolis car was the Alfa-Romeo driven by John Mauro of Denver.

(Continued to page 226)



Here's just part of the split-second timing equipment used in judging the race. Photo cells perch atop tripods. Cameras photograph the clock when it is tripped. Below, equipment is installed in a bus, complete with facilities for developing the films





Left, a helper holds the aquarium submerged as the photographer snaps the picture, right, through the glass

Aquarium Keeps Camera Dry for Underwater Shot

When he was called upon on short notice to photograph a diver underwater, one resourceful photographer kept his camera dry and got the picture he wanted by using a small fish aquarium. By placing his reflex camera inside the aquarium, he was able to shoot below water level through the glass walls of the aquarium. Two flash

bulbs illuminated the underwater subject, Nick Reinhardt, one of the winners of the Westinghouse Science Talent Search. The photograph shows Reinhardt using a diving outfit he made with a face mask, garden hose and an old paint sprayer. He uses the outfit to experiment with an underwater loudspeaker system of his own design.



Sign Reminds Driver To Dim Headlights

Motorists who drive with their up-beam are automatically reminded to dim their lights when the approaching car has a highly reflective sign mounted on its front bumper. The letters of the "dim" sign are three inches high and can be seen at 300 feet when lighted by a headlight beam. At that distance, the sign reflects 235 times more light than white enamel and 70 times more than a plastic-reflector unit.



Air-Driven Hand Tool Has Variable Speeds

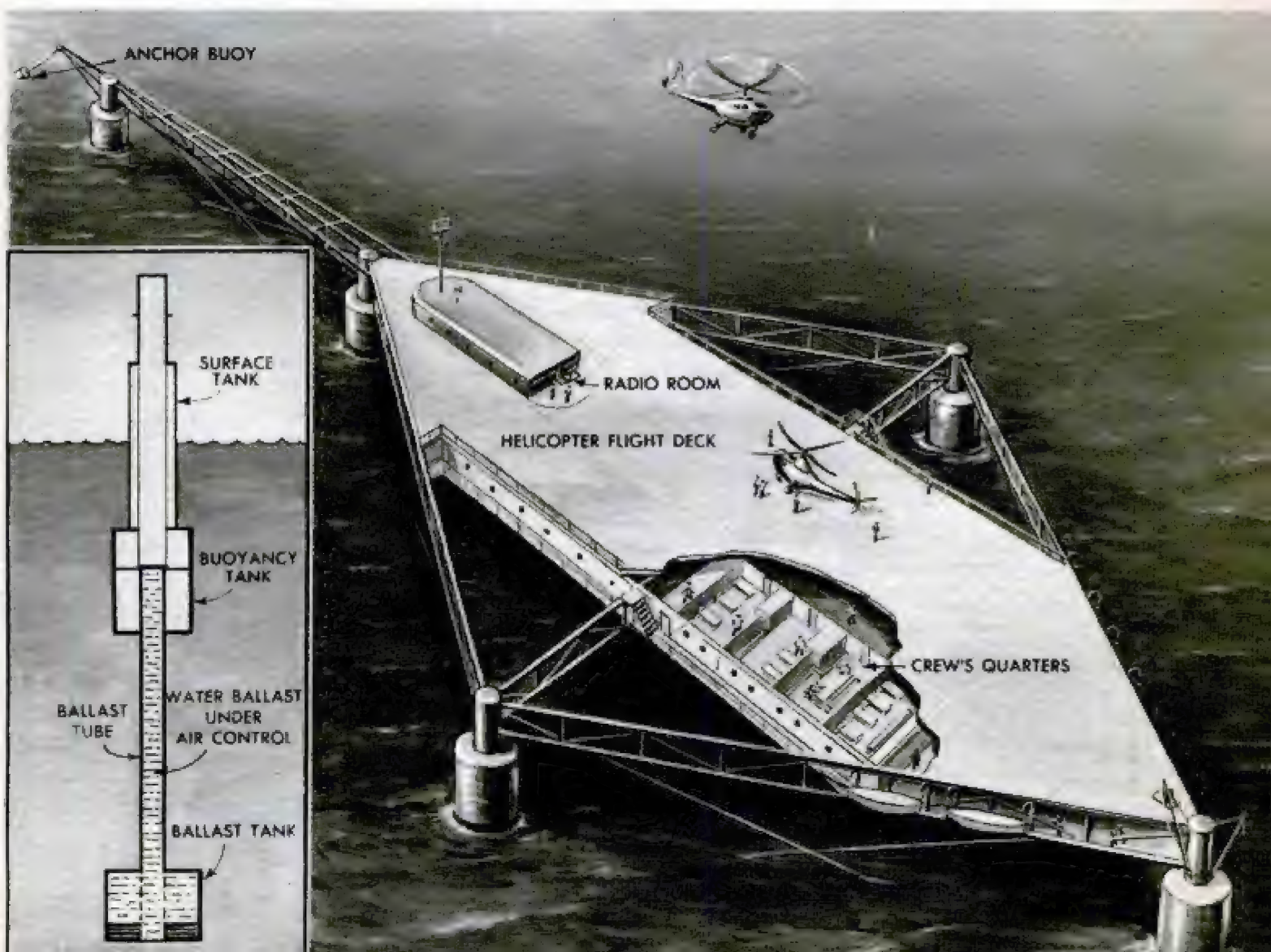
Driven by air pressure, a small hand tool can be adjusted to run at speeds from 500 to 14,000 revolutions a minute merely by turning a convenient thumbscrew, permitting slow finishing operations or high-speed grinding. Less than five inches long, the air tool is used for grinding, sanding, polishing, drilling and many other operations. A fingertip lever controls the flow of air from the compressor.



Mid-Ocean Weatherdrome

WEATHER observations spanning the Atlantic may someday be made from floating weatherdromes anchored in the high seas. The Coast Guard has asked Congress for authority to proceed with plans for the floating islands. Invented by Edward R. Armstrong, the weatherdrome would have quarters for crew members who would report weather conditions to the mainland. The inventor's plans also call for a helicopter landing deck, although the Coast

Guard says that the weatherdrome will not be specifically designed as a landing field for planes. Weighing 2000 tons, the weatherdrome would have five supporting pylons extending 175 feet down into the water. Plans call for a girderlike extension 150 feet long to project out from the 300-foot main part of the station. This would give the unit a length of 450 feet, which is longer than any wave that might strike the structure. The station would be held in place by a dome-type anchor that would grip the ocean floor firmly through friction.



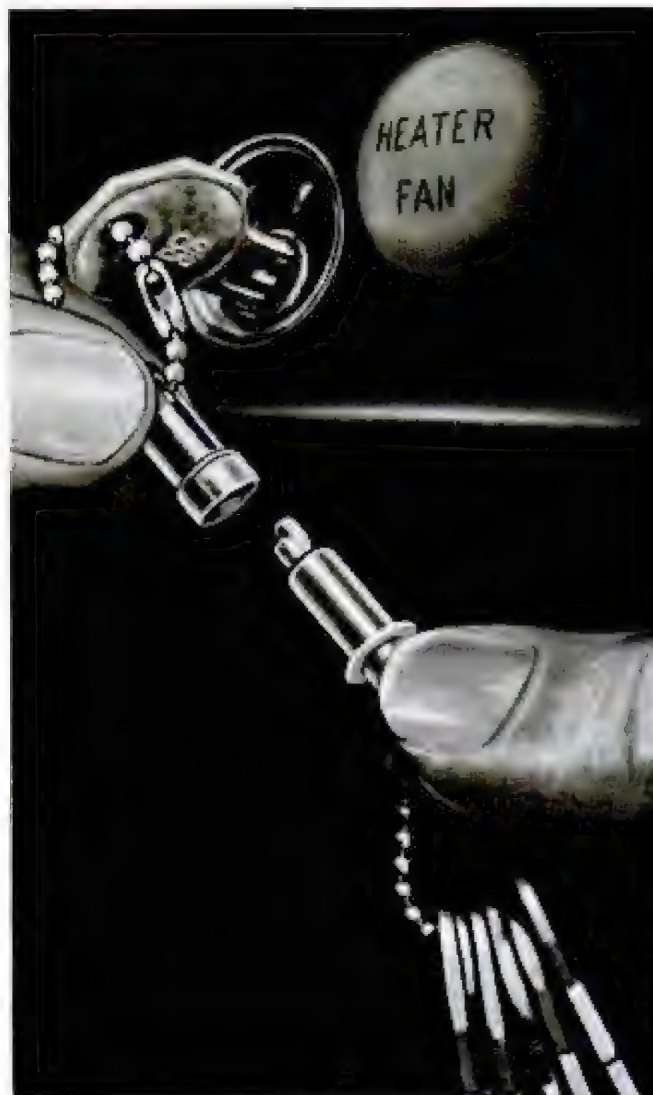


Stop Lights Change to Green When They "Hear" Fire Trucks

Emergency vehicles, such as fire trucks, ambulances and police cars, are given the green light at intersections automatically by an electric "ear" that picks up the sound of the sirens and changes the traffic signal. Directional microphones pick up the siren's wail and an amplifier converts the sound into electrical energy for changing the lights. The microphones are placed so that they are sensitive only to sirens coming from one direction. The equipment, mounted on the signal control box, switches the signals back to normal operation after a time delay long enough to allow the emergency vehicle to pass the intersection.

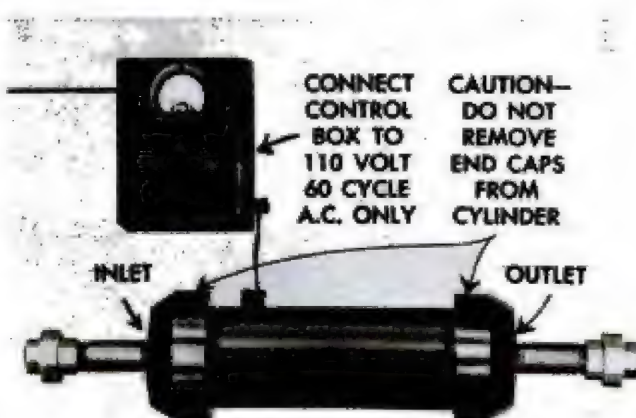
Electrical Tube in Water Tank Prevents Scale From Forming

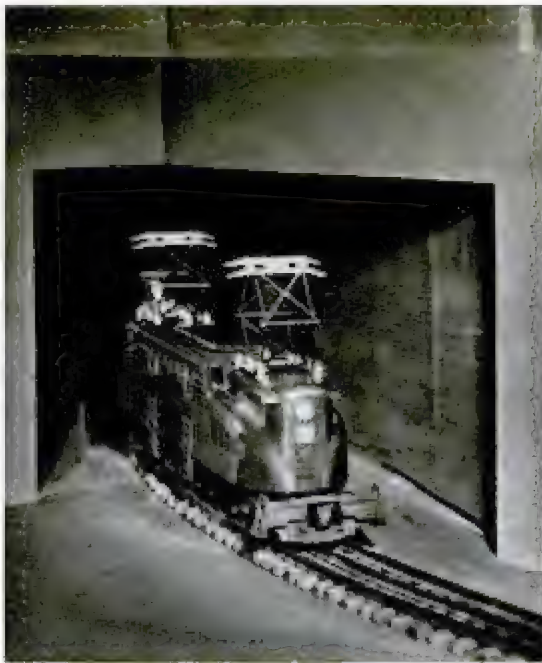
Scale is prevented from forming in boilers and water tanks by a control tube that subjects the water to an electrical field. As the water passes through the field, the particles and salts act as a conducting medium, picking up an electrical charge. Because of this charge, they no longer are attracted to tubes, castings and other metal surfaces with which they come in contact. The control tube is made of a plastic which is a nonconductor and noncorrosible.



Key Chain Comes Apart With Finger-Tip Pressure

With a coupler-type key carrier, you can leave the ignition key in your car and, with one hand, remove the other keys to open the glove compartment, luggage compartment or garage doors. The two halves of the coupler are separated by a slight tug on the locking collar. To connect the two sections, the motorist merely pushes the projecting cylinder at the base of the coupler and the two parts become one again. It's especially handy when leaving your car in a garage or parking lot.





"Radium" Train

Highballing "hot cargo" from one station to another, the "Radium Limited" is the only train in the world to carry exclusively radioactive materials. It's a model train installed in the radiation laboratory of Cleveland Clinic. Dr. Otto Glasser, medical physicist, conceived the idea of using a model railroad to carry radon, a radioactive gas produced by radium, from one part of the laboratory to another. The gas, which is dangerous because of its radioactivity, is used in treating cancer and in research work. Until the railway was installed, the clinic technicians carried the gas by hand in lead-lined containers. The railroad includes only a locomotive and a flatcar carrying a lead-lined container, and is operated by remote control. Eventually



Top, left, train backs into supply room. Top, radon "seed" is placed on the flatcar. Above, pellets were carried by hand before installation of the railroad

Dr. Glasser wants to load and unload the flatcar with automatic devices, providing further protection for the workers.



Tiny Plastic "Wing"

Nose and windshield of a 150-pound plane built by Robert M. Sebring of San Fernando, Calif., are clear plastic and the swept-back wings are plastic plywood. Building it took less than \$100 for materials and all of his spare time for three years. Ground tests indicate the craft should cruise at 65 miles an hour.

⌚ Moving stairways being installed on three Navy aircraft carriers will carry fully equipped pilots up to their flight deck in one minute.

CARVING in CRYSTAL



With a grease pencil, Franciska Patsalie draws an original design on this glass goblet to guide the grinder who will carve it skillfully in the crystal

By Lyn Harrington

BEAUTIFUL crystal, carved to order, has promoted a hobby into a successful business in Victoria, B. C. Started as a hobby by Mrs. Franciska Patsalie, the glass-carving company now keeps six persons busy full time, producing mirrors, glass tops for tables, stemware, tumblers, bowls and plates.

Designs vary with the customer. A singer chose the novel effect of bars of music on her glassware. One retired grain farmer preferred a graceful wheat design. A Western cattleman had his steins engraved with his cattle brand.

Mrs. Patsalie learned the carving art in her uncle's shop in Vienna. Both she and her husband are creative artists, sketching the designs freehand on the glass with a grease pencil. The glass is ornamented with patterns made by abrasive wheels of aluminum oxide. Each wheel edge is shaped to an exact curvature so that it produces a specific result.

When the glass touches the wheel, it is roughened and dulled. This frosted appearance produces interesting variations, depending upon the play of light. A delicate line is made by a stone brought to a peak

Photographs by Richard Harrington

in the center of its grinding face. The same peak makes the oval petals of a flower when the glass is held obliquely. Pressure is an important part of the art—an inexperienced worker can rasp a hole in fine glass in no time. A stone with a convex edge is used to grind circles and oblongs.

For picture frames and mirrors with beveled edges, the bevel is made first on a large iron wheel, revolving horizontally, on which Carborundum drips slowly. Then the glass goes to the smoothing stone, a circular natural stone about four inches thick. The final polishing is by buffer, a felt belt impregnated with jeweler's rouge, to bring back the sparkle to the cut surfaces.

Buffing also eliminates the inevitable fine scratches which appear greatly magnified once a piece of plate glass is silvered. If the scratch is too deep to be buffed away, the piece must be discarded or the design changed to incorporate the scratch. A new and beautiful design may owe its existence to just such a slip of the cutter's wrist.

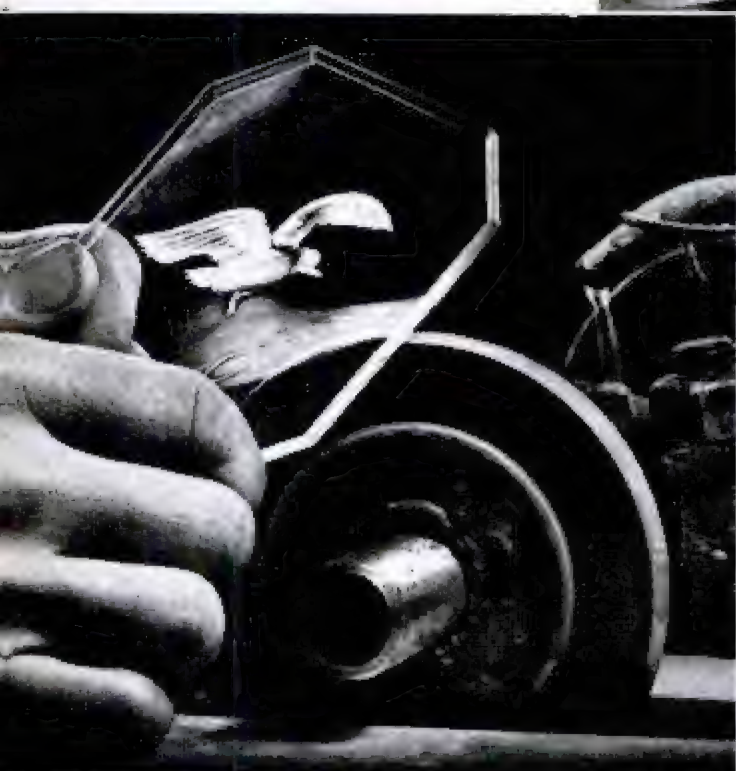
Using creative imagination, native talent and an occasional accidental flaw, the Patsalies have carved their artistic reputations in crystal.



Above, a sheet of plate glass is laid over a drawing and the design traced on the glass with a grease pencil. The tracings are not followed exactly, but serve to assure the desired proportion and effect. Right, the delicate lines of this musical design are cut in the glass by a wheel with a beveled edge



Right, after the crystal has been cut, the roughened parts are polished with this felt buffer. The glass shown in this picture will be a mirrored frame. Below, the beveled grinding wheel is being used here to carve an attractive design on a plate-glass coaster. The stream of water keeps the wheel cool





Motorized Window

Just flip a switch and a new motorized window disappears into the wall as a screen moves into place. The screen is supported by a roller in the wall above the window. Its bottom edge is fastened to the double-glazed panel. When the switch is turned, the motor rolls up or lowers the screen, moving the window to the desired position. Because the window is double-glazed, no storm sashes are required. The window is made in all standard sizes.



Midget Woodworking Shop

Modelmakers can turn out intricate work on the power tools of a midget woodworking shop that can be carried from room to room like a portable radio. Consisting of a bandsaw, drill press and grinder, the power-tool kit is driven by a $\frac{1}{20}$ -horsepower motor. The largest tool, the bandsaw, stands only 10 inches high and the tiny grinder is less than 4 inches high. All tools are made of plastic and come complete with pulley and belt system.

Automobiles Turned on "Spit" for Rustproofing

Automobiles are being completely rust-proofed at a Birmingham, England, factory where the bodies are impaled on a "spit" and revolved through a series of six tank

British Information Services photo



baths. During the process they are cleaned, rinsed twice, covered with a rust-resisting compound, rinsed again, dipped in a 5000-gallon vat of paint and baked. Similar treatment is given the chassis. The whole process takes 107 minutes per car and the plant handles 18 an hour. Cars treated can be left indefinitely in the open in any climate without rusting. Even if the protective coating is broken, rust will attack only the exposed metal and will not spread.

Farm Accidents Costly

Over half the average U. S. wheat crop could be produced in the time lost annually through farm accidents. They cost the nation \$1,000,000,000 yearly, according to the National Safety Council. With falls, burns and firearms as the main causes, one third of the 19,000 annual farm deaths occur in homes. Nonfatal accidents total 1,500,000 each year.

A WINDOW demonstration and a minor accident started Mrs. William Harshbarger on a hobby that has grown to nationwide proportions—the making of life-like roses, carnations, orchids and other flowers from wood fiber.

The window demonstration was staged in a downtown Akron, Ohio, store by a man who was selling flower-making materials. Mrs. Harshbarger, happening by, became so fascinated that she went inside to talk to the demonstrator. She asked him so many questions that he decided the easiest way out would be to organize a class in flower making. Of course, Mrs. Harshbarger was one of the first enrollees.

It was while she was practicing with flower-making materials on the dining-room table that a friend of her husband accidentally spoiled some of them. Desiring to make amends, he asked her to fashion some roses he could give to a lady friend. That started the sales ball rolling; and in the 10 years since the dining-room accident, she has delivered corsages, wreaths, bouquets, individual blossoms and special floral arrangements to virtually every part of the United States and several points



This corsage can't wilt! The realistic orchid and lilies of the valley are expertly formed of a wood fiber that is imported from the island of Formosa

By Walter E. Burton

FLOWERS THAT NEVER FADE



Even the most exacting bride wouldn't mind holding a rose spray like this one when her wedding picture is taken. Mrs. Harshbarger's flowers will not wilt under the intense heat of floodlights in a photo studio



Left, the first step in the flower-making process is cutting the wood fiber into petal shapes. The petals being trimmed here are for a rose. Right, gum-arabic cement is applied to the petals to hold them in place

beyond and has drawn upon worldwide sources of raw materials.

The wood fiber that Mrs. Harshbarger uses for flower petals, buds and other parts comes only from Formosa. It is made from the pith of a species of a bamboo plant which grows in swampland forests and which is sometimes grown in the United States for decoration. Formosan natives slice the pith into thin sheets of somewhat varying thickness, much as wood veneer is cut. In America, these sheets are available from importers in various colors and have a soft, petal-like feel. Wood fiber is easily cut and cemented, is durable and retains its resilience. A carnation or other blossom made of it can be crushed flat in the fingers, yet will spring back to its natural shape upon release.

Mrs. Harshbarger purchases the wood fiber and other supplies through regular supply houses. Flower making is a widespread activity in this country and there are a number of dealers to supply the raw materials. The large number of artificial-flower makers does not worry Mrs. Harshbarger because she has had little difficulty in selling her products. She attributes the superior appearance and lasting qualities of her flowers to skill, patience, one or two minor trade secrets and her desire to make the flowers as much like the real blossoms as possible instead of being satisfied with approximations.

The production of scores of different flowers has made it necessary for her to develop about 140 different patterns for petals and other parts. She is able to produce the astonishing total of 428 different blossoms. Most of the wood fiber she uses is purchased already colored, so her first step is to cut out petals, sepals and other parts according to pattern. Several layers of the fiber can be cut at once with ordinary scissors. Such parts as leaves, the

complete calyx, stamens and pistils are obtainable ready-made, although when a rare type of flower is to be reproduced, the flower maker usually has to form all of the parts. Mrs. Harshbarger uses a spray gun to apply a thin coating of shellac to the leaves to give them a natural appearance and to help preserve them.

In assembling the parts, she uses a gum-arabic cement. To the gum, which she obtains in unrefined form, she adds glycerin, perfume and other ingredients. The brewing of this cement is a ticklish process she has worked out patiently by trial and error. She applies the hot adhesive with a brush to such parts as rose petals, which are made by gluing together two or three thicknesses of the wood fiber and then curling the edges around a pin or needle before the gum arabic sets. In some cases, she applies artists' colors of India ink to produce a natural-looking tint or vein pattern.

The wood-fiber flowers have proved to be extremely durable, which accounts for much of the demand for them. Usually, accumulated dirt can be removed by brushing or with a vacuum cleaner. If that doesn't work, corn meal can be used. It is applied liberally to the flowers, worked well into all parts, then shaken out, much as a furrier might clean a fine pelt. Some people have washed their wood-fiber flowers with water and soap.

Mrs. Harshbarger's flowers are used by numerous portrait and commercial photographers. In fact, she has made a special effort to produce bouquets, corsages and other arrangements that will help lighten the photographer's problems. Artificial flowers often are preferred to the natural variety for use in bridal pictures, for table decorations involving blossoms, and wherever single blossoms or arrangements are to appear in a picture. In making white roses or other white flowers for photographic



Left, before the cement has set, the edges of the petals are curled around a pin. Right, the center bud of the rose is formed by wrapping scraps of wood fiber in a sheet of the same material and tying it with wire

purposes, Mrs. Harshbarger uses a special white that does not appear too light in a picture. The intense heat of studio lights will wilt natural flowers in a few minutes, but it has no effect on the wood-fiber variety. For this reason, the Akron flower maker is attempting to interest motion-picture studios in her work. Her products are also used in funeral parlors, in store-window and

(Continued to page 226)

Right, wire of the bud is threaded through the petals. Later, the calyx, leaves and stem covering are added. In the display below are white carnations, calla lilies and Oriental poppies





Plastic "Tarpaulin" Protects Linemen

Telephone linemen are protected from wind and rain by a Vinylite plastic "tarp" that can be draped over wires without shorting, because of the insulating quality of the material. Hot solder spilled on the sheeting will not burn through and, being transparent, the cover does not shut out light. The plastic can be folded when wet without danger of rotting.



Iron Out the Wrinkles With This Suitcase Handle

Living out of a suitcase is no excuse for wearing wrinkled clothing when the suitcase has a handle that detaches to become an electric iron. The base plate of the handle fits snugly into a recess in the top of the suitcase and can't jar loose. The cord is permanently attached to the iron, which has an automatic heat control. If you have to leave the suitcase unwatched, you can remove the handle, making it difficult for petty thieves to walk off with your property. The suitcases are available in a variety of colors.



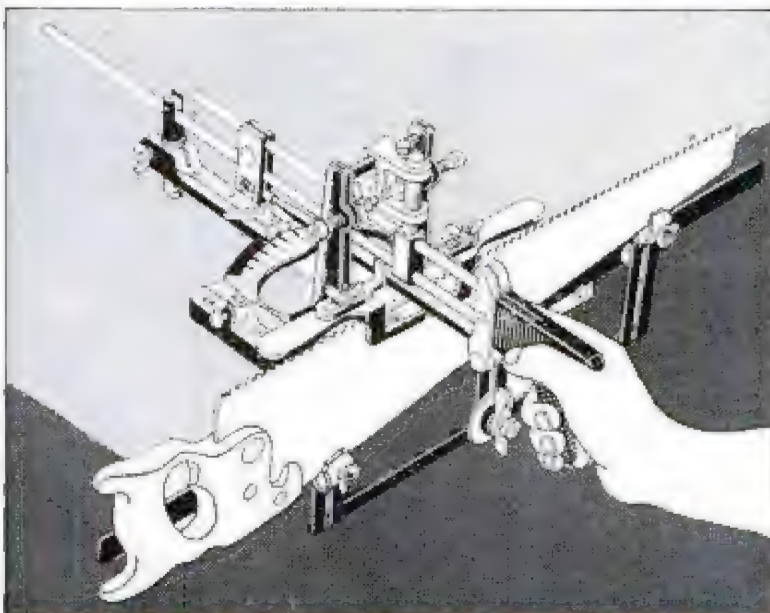
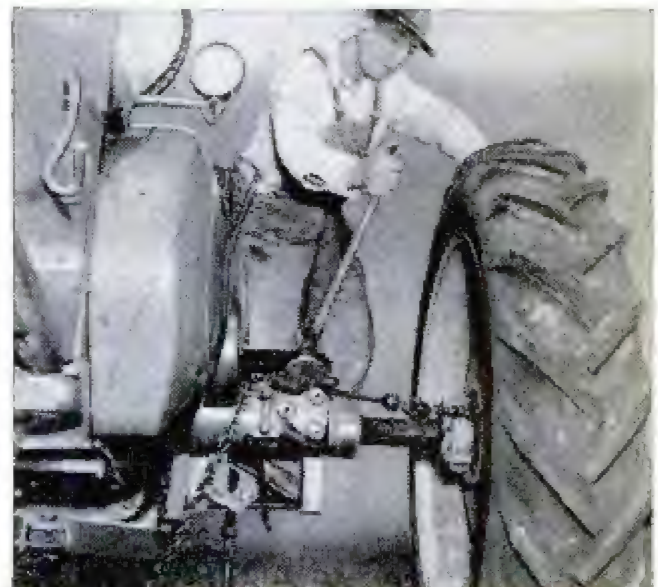
Huge Drawing Guides Mosaic

Measuring 21 feet 8 inches in diameter, a giant ink drawing will serve as a guide in making a government mosaic. The U. S. Bureau of Reclamation drawing shows an inverted outline of man's mightiest hydroelectric generator at Grand Coulee Dam in Washington. It will be outlined in permanent terrazzo in the west powerhouse at the dam. Travelers, who visit the dam by the thousands, will walk across the mosaic. Heavy lines on the drawing represent zinc strips which will separate the various colors of mosaic.



Hoist-Jack Lifts 2000 Pounds

With a rated capacity of 2000 pounds, a portable tool can be used either as a hoist or a jack. It is designed for factory, shop and farm use and has a ratchet-and-pawl construction. The tool consists of a two-piece pipe stand with a base, the hoist unit and a safety handle that will bend before the hoist is overloaded. When the handle is pumped up and down, the top of the stroke is just even with the top of the frame, making it possible to operate the hoist in very little headroom. The tool can be used as a tractor-wheel puller, car jack, fence stretcher, post puller, load binder and utility hoist. It weighs 23 pounds and can be packed in a space 23 inches long.



Guide for Sharpening Saws Adjusts to Any Tooth Size

Accurate filing of a saw is possible with a new guide that controls the depth, hook, bevel and the feed of the next tooth. One adjustment prepares the filer for saw teeth of any size. The file is clamped in the guide and pushed with a handle. After a tooth is sharpened, the file is raised up and over, coming to rest against another tooth. The filing guide is made of bronze and aluminum, with steel guide rods. One model files hand, band or circular saws while another is made for hand-saws only.

Car-Top Boat Carrier Swings Craft Into Position



Sportsmen can carry their boats atop their cars, yet have them ready to launch within three or four minutes, with a new carrier that operates on swinging arms. The aluminum arms are clamped to the right side of both front and back bumpers. While they are resting on the ground, the boat is fastened in place. Then as the boat is lifted, the arms swing it over and deposit it on top of the car. Suction cups hold it securely in position. The boat can be mounted or detached by one person. Boats weighing up to 125 pounds can be handled by the swinging carrier.

Mailbox "Hangs" Atop Chain

Motorists driving past the mailbox of Frank Miller, La Crosse, Ind., turn around for a second look. They see a mailbox standing atop a length of chain that apparently has no support. Miller welded the links of the big log chain together, set the base in concrete and then used the rigid chain as a unique post for the mailbox.



Cleanup Brush Inside Golf Ball

Twist a new golf ball apart and inside you'll find a bristle brush and a metal spike. Actually the product is a replica of a golf ball made of Tenite plastic. One half contains the nylon brush, useful for removing dust and dirt from golf clubs, clothing, hats and shoes. The metal spike in the other half serves two purposes—it holds the two halves of the ball together and is a handy tool for scraping mud from shoe cleats or clubs. To avoid the possibility that a golfer might accidentally drive the ball-brush down the fairway, the ball is available in bright red, green and yellow as well as conventional white.



Belly-Tank Auto Travels 45 M.P.H.

Streamlined like a torpedo, a miniature automobile, built by Emory Stanfield of Los Angeles, Calif., is made from a P-38 belly tank. The vehicle is 13 feet long, weighs about 500 pounds and cruises at 45 miles an hour. The state licensed it in the motorcycle classification. Mounted behind the seat, the one-cylinder, 5½-horsepower engine is geared to provide two forward speeds and one reverse. The motor uses a motorcycle battery. A chain drive delivers the power to the rear wheel. A full gas tank — two gallons of fuel — carries Stan-



field 114 miles. Airplane tires are used on the three wheels. Cost of building the car was \$400.



One Hand Rows Boat With Oar Joiner

Fishermen can row their boat with one hand while casting with the other with the aid of a spring that fastens the oars together. Each end of the spring is locked to one oar, thus both oars can be moved with one hand. By twisting the hand, the rower can lift one of the oars out of the water to turn the boat.



Top, left, fisherman twists hand, lifting one oar out of the water to guide the boat. Left, the spring fastens over handles of the oars, locking them together

Old-Time Pumps Built From Kits

Models of old-time fire engines, complete to pump and piston, fly-wheel and valve, can be built from kits that contain all the materials. The models are replicas of several horse-drawn fire-fighting vehicles. The parts are semifinished. The pumps are enameled in bright red and gold. Fire departments as well as hobbyists are exhibiting the models.



WHAT'S NEW *For Your Home*



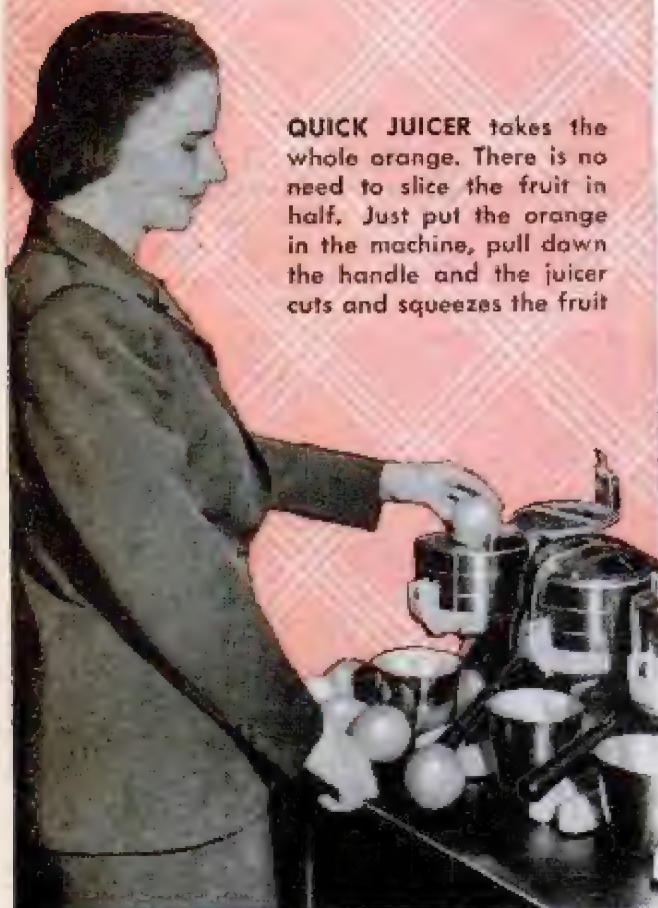
PRESSURE COOKER can be opened as food cooks. It ends shrinkage and pre-searing of meats. Steam is locked in jacket—see inset



FOOD STAYS HOT on a serving tray with a glass top that is heated by electricity. Plug in the cord and a thermostat keeps the glass at a constant 200 degrees



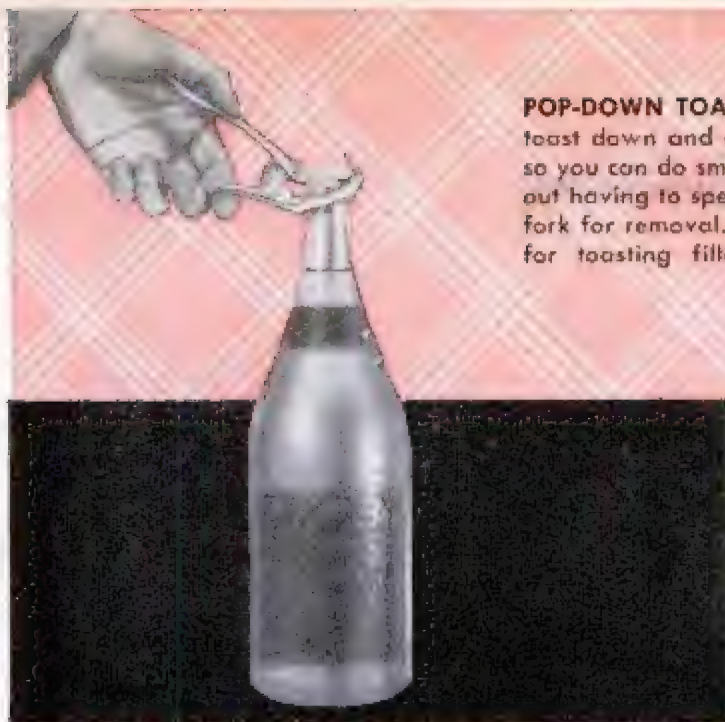
ROLLER ACTION of paring knife lets you adjust the depth of cut by using any of three rollers. It peels, slices or shreds, depending on size of the roller used



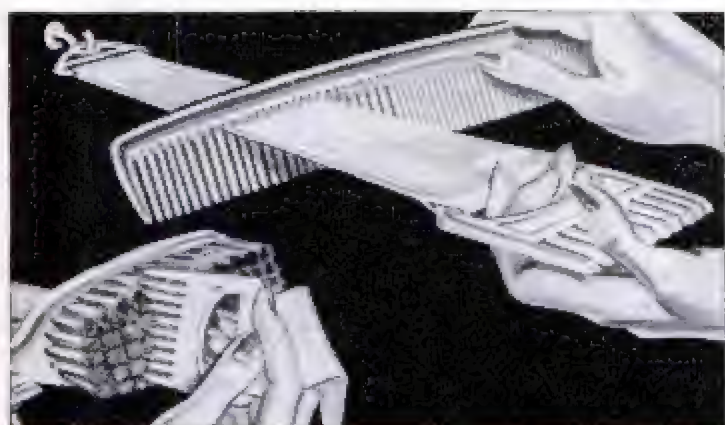
QUICK JUICER takes the whole orange. There is no need to slice the fruit in half. Just put the orange in the machine, pull down the handle and the juicer cuts and squeezes the fruit

FLORAL ARRANGEMENTS are easy to set up and change when you use a transparent-plastic stand that is held securely to the bowl by a rubber suction cup





ONE-HAND OPENER holds the bottle and removes the cap with one easy squeeze of handles. The cap is undamaged and can be used to reseal the bottle



COMB-BRUSH CLEANER combines two functions in one piece of equipment. The stranded section is for cleaning combs and the toothed end for brushes

SCALLOPER for the home sewer comes in several sizes. Made of Vinylite, it will not warp or curl. It can also be used as a ruler and a button spacer



POP-DOWN TOASTER slides the toast down and out when done so you can do small pieces without having to spear them with a fork for removal. Has two racks for toasting filled sandwiches



AUTOMATIC PORCH LIGHT goes on when bell button is pushed. It turns itself off in about five minutes



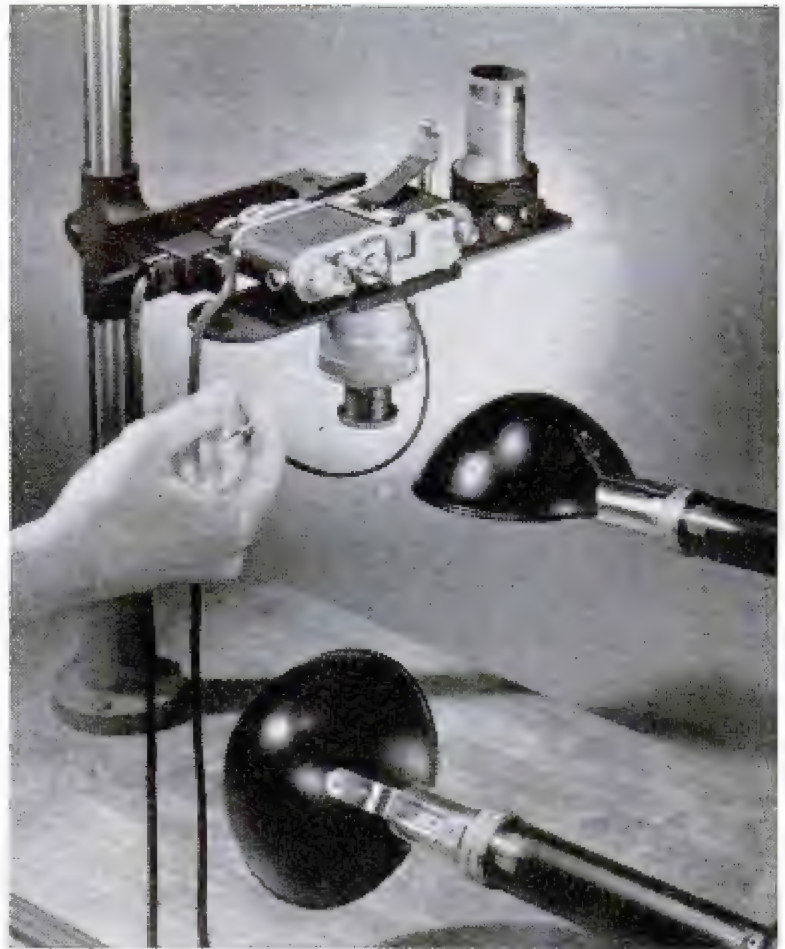


Crash Radio for Aircraft Transmits Automatically

Helping rescue parties locate crashed aircraft, a compact radio starts transmitting automatically when the plane crashes. The transmitter weighs only 10 pounds and is powered by two crashproof batteries. Its range is about 18 miles. The antenna is mounted on a pivot and is pulled into a vertical position automatically by a weighted base. The set will float if dropped in water. It is mounted in the tail of the plane, since this is the section that is least likely to be destroyed in a crash.

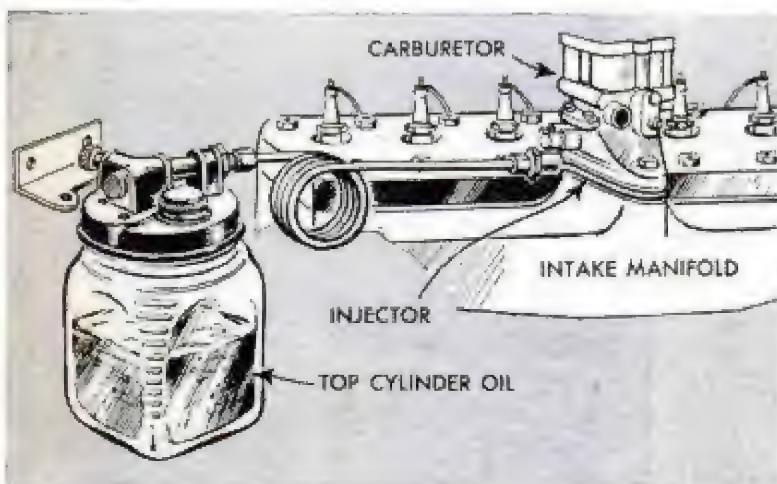
Slide Makers "Freeze" Bugs With Synchronized Flash

Photographers who use the Leica for making slides of live insects can now stop action by illuminating the subject with synchronized flash. With the synchronizer, the full range of shutter speeds up to $\frac{1}{1000}$ second can be used. As many as three lights can be fired by the unit when working at small apertures.



Pliers That Pulverize Can't Damage Machinery

Because they pulverize under pressure, safety pliers used for feeding material into a punch press cannot damage the machinery if accidentally caught in the die. In addition, the aluminum alloy pliers are safer for the machine operator since there is no danger of flying fragments. Despite the pulverizing characteristic, the pliers are sufficiently strong to handle sheet material.

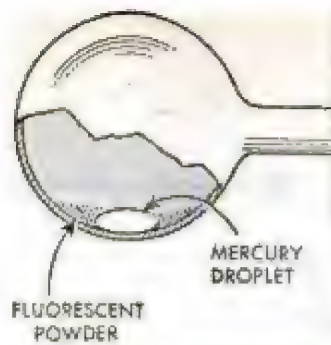


Upper-Cylinder Lubricator

Top cylinder oil is introduced into the intake manifold of a gasoline engine by a metering device that assures lubrication and reduces carbon formation in the upper cylinder section. A fine spray of the oil mixes with the gasoline as it passes from the carburetor to the combustion chamber. The lubricator is connected by a tube to an injector plate sandwiched between the carburetor and manifold.

Nonelectric Light Bulb Glowes When It Is Shaken

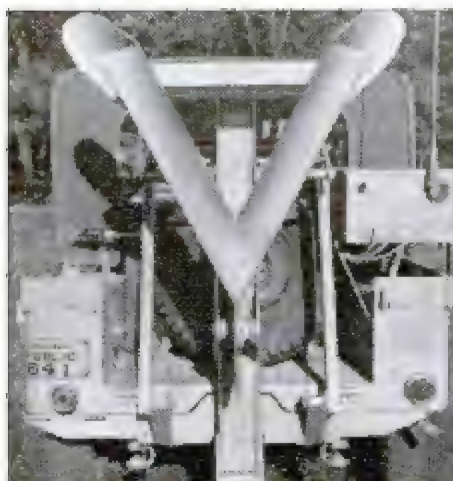
As if by magic, a new fluorescent light bulb that uses no electric current lights up when you shake it. Inside the sealed bulb are a small drop of mercury, some fluorescent powder and a small quantity of rare gas. When the bulb is shaken, these materials combine to produce light. With no filament to burn out, the bulbs should last indefinitely. They can be manufactured in a variety of shapes and sizes. Various colors are produced by using different fluorescent powders inside the bulbs. Plans are being made to use the bulbs as fish lures, which would glow brightly when agitated by the action of the water. Other possible uses of the bulbs are as auto taillights, distress-signal lights and novelty lights for bicycles.



Plow on Fire-Fighters' Jeep Cuts a Four-Foot Furrow

Forest fire fighters now can stop the spread of flames across a forest floor with a jeep plow that cuts a double furrow about four feet wide. The V-shape plow is made of two pieces of steel pipe cut into the proper shape and welded together. A five-inch I-beam supports the plow and a rolling coulter cuts roots and lifts the blade over obstructions. A hand winch raises and lowers the plow. To balance the jeep and provide traction for the front wheels, a 250-pound counterweight is mounted on the front bumper.

Above, the V-shape plow turns a double furrow in the forest floor to stop spreading flames. Below, left, when not in use, the plow is pulled over on its back inside the jeep. Below, right, winch lowers the plow

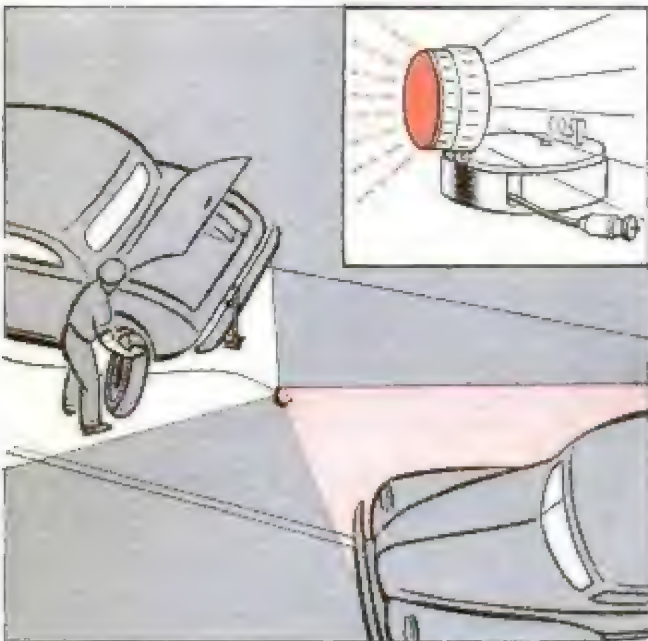


Solid Sides of Auto Transport Protect New Cars From Road Dust



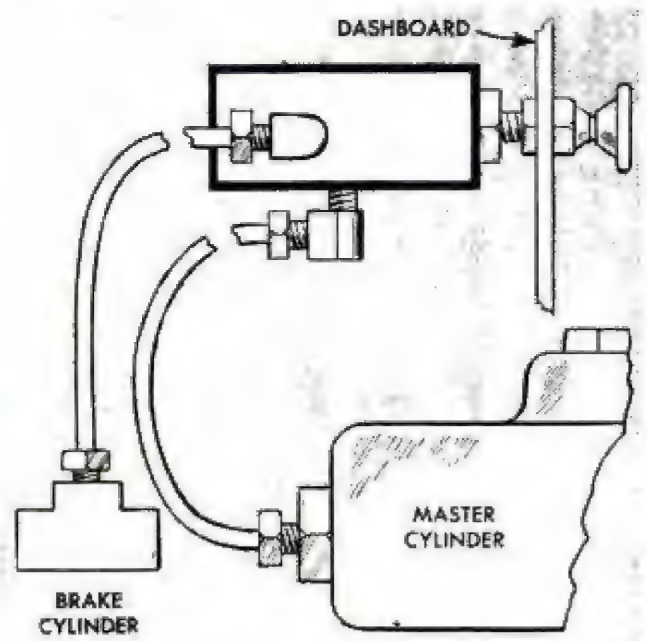
With its lower portion completely enclosed to protect the load from dirt and damage, a new automobile transport carries five cars instead of the four-car load of conventional carriers. Three cars are loaded in the main unit and the trailer car-

ries two more. All ramps for loading and unloading are hydraulically operated from a power take-off, enabling one man to do the complete operation. The transport has a front-wheel drive with the engine being located under the cab.



Tire-Changing Light

Changing a tire after dark is easier and safer with a combination warning and work light that plugs into the car's cigarette lighter. The 17-foot electric cord unreeles from the base of the light. A white, continuous light shines on the working area and a red signal blinks to warn other motorists. The cord is rewound by holding the base and turning the light.



Dashboard Hill Holder

Your brakes are held on by a finger-operated dash button that allows you to take your foot off the brake pedal when starting up on a hill without causing the car to roll back. Nonelectric, the switch is installed between the master cylinder and the hydraulic line to the brake drums. It can also be used to lock all four wheels while you are changing tires.

ROLL THIS PHOTO LAB to your kitchen sink and you have a complete apartment darkroom at your fingertips. Turn to page 201 for construction details

the CRAFTSMAN section

WEAVING A REED CHAIR SEAT is easy. Just bring that old ladder-back chair down from the attic, spend a couple of hours reeding the seat and there you are, good as new. Start-to-finish instructions, page 174



A PORTABLE BOWLING ALLEY for your rumpus room is described on page 187. Keglers of all ages match their skill by rolling a golf ball at pint-size tenpins. Looks like a cinch, doesn't it? Maybe, but just try it!



WAVE-POWERED MOTOR drives 3-ft. model at rowboat speed. Page 182 tells how to make it and how it works



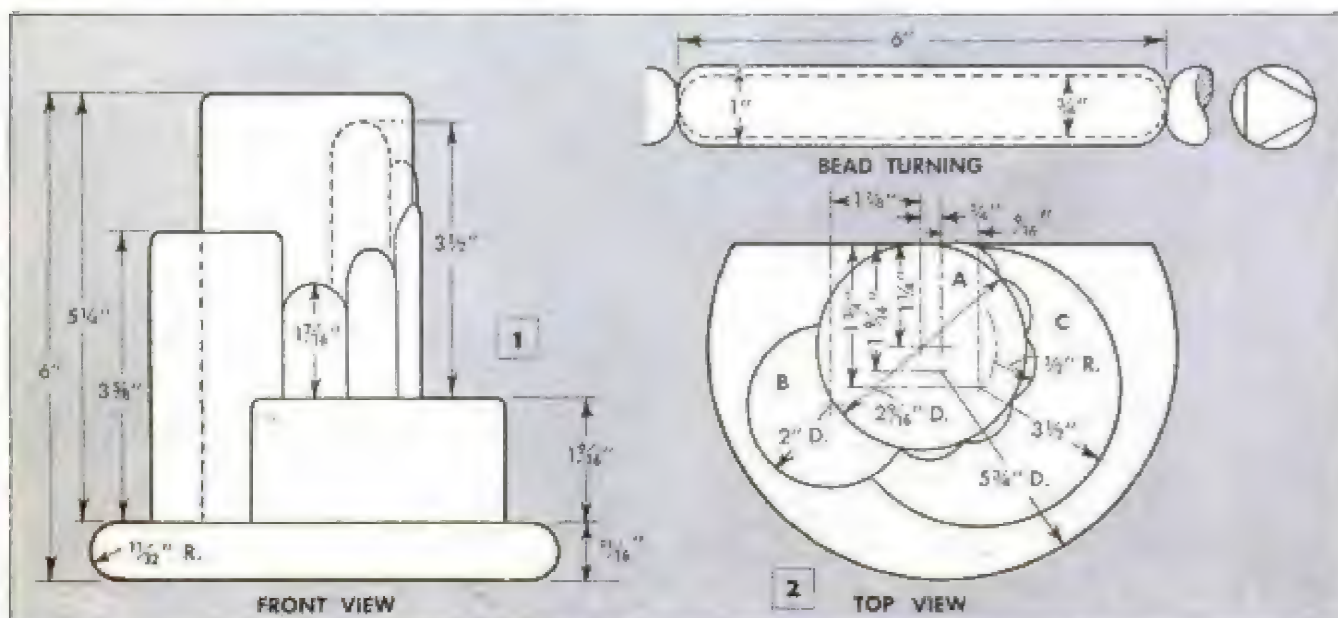
MODERN BOOK ENDS

**By
Milt Evans**

INTERLOCKING cylinders of contrasting woods, such as maple and walnut, are assembled in pyramidal fashion to form this striking pair of modernistic book ends. Largely a simple lathe project, the various parts are turned in pairs, after which they are cut apart with a parting tool, Fig. 3, and shaped to nest together. Figs. 1 and 2 give the diameters and lengths of the three cylinders, A, B and C and also the dimensions of the beading and the base.

Before starting to turn the parts of the book ends, it is best to lay out a full-size pattern of the base as in Fig. 2, using a compass to mark the positions of the three cylinders. Begin the project by turning a pair of the tall, center cylinders, part A.

making them $2\frac{1}{16}$ in. in diameter and $5\frac{1}{4}$ in. long. The upper ends are faced-off smoothly and the edges rounded slightly. In the same way, parts B and C are turned to the sizes given in Fig. 2, their top edges also being rounded. While part A of the original set of book ends was hollowed out to receive part B as shown in Fig. 4, this part can be left intact and part B cut out instead. The latter procedure is somewhat easier, especially for the inexperienced craftsman. To do this, place the paper pattern over the end of part B and mark the contour of part A. Then, roughcut the piece a little to the right of the contour line so that enough waste stock will remain to permit sanding. If a bandsaw is available,



you can make this cut with the piece standing vertically. Otherwise, a gouge can be used to work the stock down to the line. Then, with fine sandpaper wrapped around part A, use the latter as a sanding block to smooth part B to a perfect fit. Part C is cut out in the same way, marking it from the paper pattern and fitting it to the contours of both parts A and B.

The bases of the book ends are 5 $\frac{3}{4}$ -in. disks, $\frac{1}{16}$ in. thick, and their edges are rounded to an $\frac{1}{2}$ -in. radius. The portion of each base which will be at the back of the book end is cut off flat $1\frac{5}{16}$ in. in from the edge, and the top of the base is marked to match the paper pattern, Fig. 5. Three countersunk holes are drilled up through the bottom of the base. These are for screws which fasten the vertical members in place. The screw holes should be located near the outside edges of the scribed circles so the center of the base can be recessed and filled with lead to weight the book ends.

To add decoration, lengths of beading can be applied vertically around the center cylinder, part A. These are cut in five different lengths graduated from $1\frac{1}{16}$ in. to 3 $\frac{1}{2}$ in. and are arranged to form a spiral design. The beads for both book ends are cut from two sausage-shaped turnings as shown in the upper detail of Fig. 2. Sections $\frac{3}{16}$ in. thick and $\frac{3}{4}$ in. wide are ripped from the turnings as in Fig. 6. These are cut to length and suitable flats are filed on the sides of part A to allow the beading to set flush. The top portions of the flats will have to be rounded to match the ends of the decorative beading.

To assemble the book ends, glue parts A, B and C together, clamping them by wrapping round and round with cord. Then, glue and screw these parts to the bases and glue the beading to part A. After the glue is dry, weight the book ends and glue felt to the bottoms. The units can be finished simply by waxing and polishing after final assembly.

Half-round strips of molding are formed by slicing sections from the sides of sausage-shaped turnings



Different sizes of cylinders for the book ends are turned in pairs and separated with a parting tool



Above, center cylinder is hollowed out with a gouge to receive smaller cylinder, part B. Below, after one side of base is cut off flat, compass is used to transfer positions of cylinders from paper pattern



Flashing Compound Applied Neatly With Kerosene-Dipped Paddle

Home Repairs

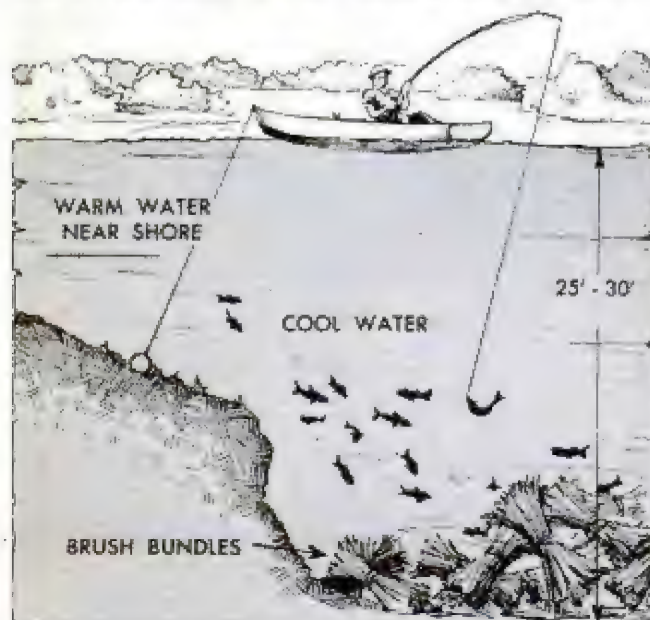


Because of the stickiness of flashing compound, it is somewhat difficult to apply it neatly around chimney flashing. However, a neat job can be done quickly if a wooden paddle dipped in kerosene is used to smooth the compound. If the paddle is dipped in the kerosene frequently, the compound will not adhere to it.

Ralph McClung, Hitchins, Ky.

Brush Jungles in Cool Water Improve Midsummer Fishing

During the hot summer months when the shallow water near shore gets warm, game fish, pan fish and catfish prefer to stay in the cooler deep water during the day. How-

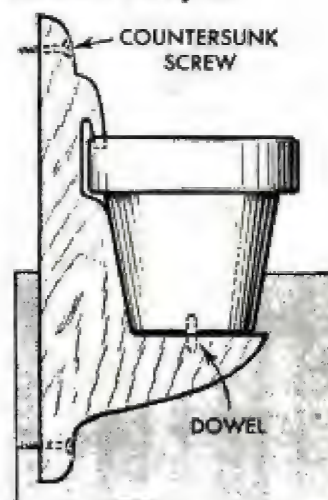


ever, good midday fishing can be had if brush jungles are sunk at strategic locations to attract the fish. The jungles consist of bundles of tall brush, 6 to 10 ft. high, which are towed into the lake, weighted with heavy stones and sunk some time prior to the fishing season. A dozen or two large bundles will form a satisfactory jungle. This will be successful if built in any of three places which are easy to find in most lakes. The first location is in 25 to 30 ft. of water just below the drop-off. The second is in 20 to 30 ft. of water out from the point where a stream flows into the lake, and is excellent because fish lie in such places waiting for food carried into the lake by the stream. The third location is a spot where cold water bubbles up from a spring hole on the lake bottom. The jungles can be located by aligning them with trees or landmarks on the shore or, if desired, the spots can be marked with buoys. The latter need only be corked bottles anchored with stones. Occasionally baiting the jungles with ground rough fish, such as carp, is an added attraction for all kinds of fish, but especially catfish and bullheads.

R. A. Jenkins, St. Louis, Mo.

Wall Bracket Holds Flowerpot

Just the thing to brighten a drab corner on the front or rear porch, this wooden flowerpot bracket is screwed to a wall or post. The bracket is sawed approximately to the shape shown in the drawing, its size being determined by the size of the flowerpot. The rim of the flowerpot fits into a slot in the edge of the bracket, and a short dowel holds the bottom of the pot to the base of the bracket.



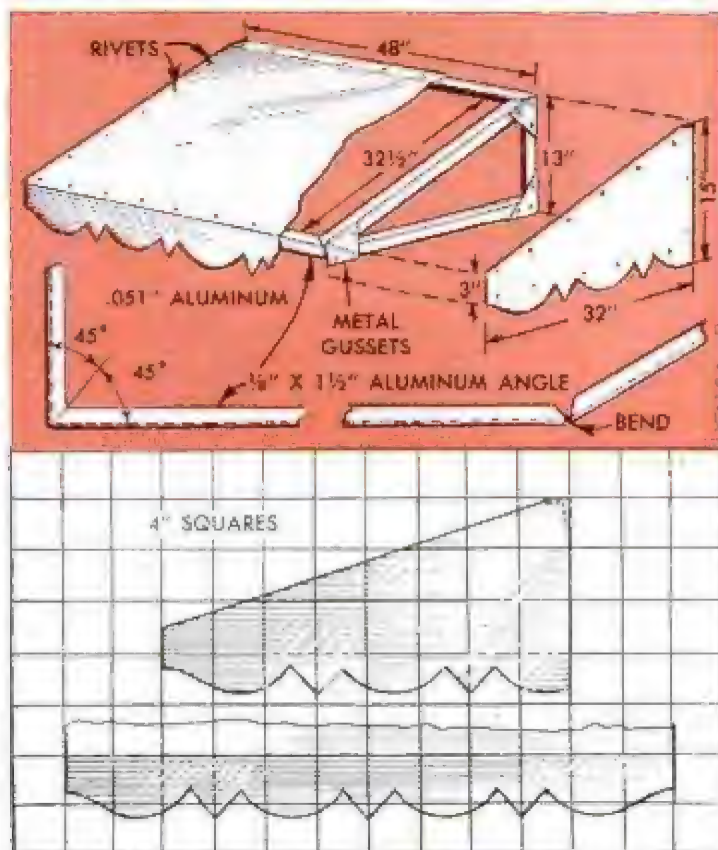
A. V. Malone, Los Angeles, Calif.

Sturdy Louvers for Barn or Garage Have Sheet-Metal Slats

Combining economy with quick assembly, sturdy louvers for a barn or garage are made by fitting slats of galvanized sheet metal into wooden endpieces. After the slats are cut to size, their ends are pressed into angular saw cuts made halfway through the width of the wooden uprights. Then facing strips are nailed over the edges of the uprights to hold the slats in place.

Werner Kraatz, Santa Cruz, Calif.

Durable Aluminum Canopy Resembles Awning

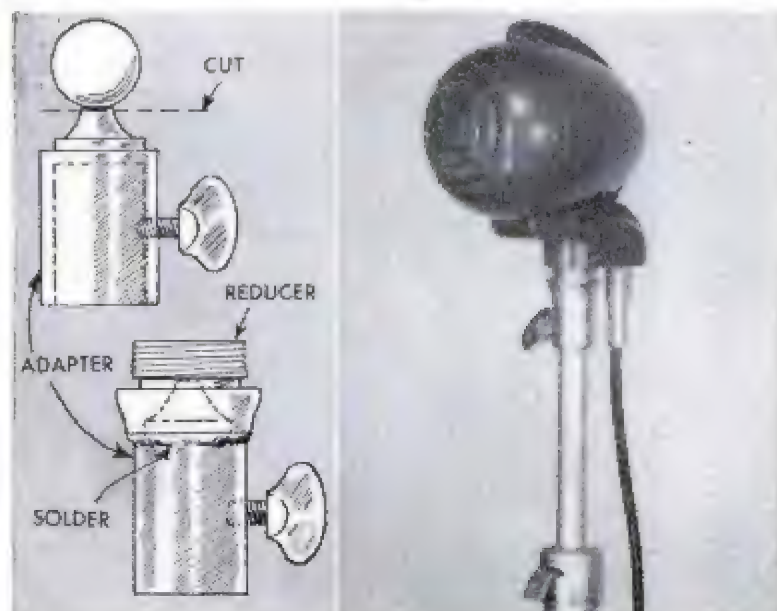


This door canopy is supported by a rigid aluminum-angle frame to resist high winds and to prevent sagging. The slanting, or top, section of the frame is bent U-shaped from a single length of aluminum angle notched at the corners. This part is fastened to a second U-shaped section which forms the back. Lower members of the sides are separate lengths of angle, and the parts are held together with metal gussets riveted at the corners. The top covering is cut from sheet aluminum according to the squared pattern and is riveted to the top

and back frame members. The covering for the ends is also cut from the pattern and riveted in place, using filler strips of aluminum between the gussets to give a smooth joint. The strips should be the same thickness as the gussets. Attach the canopy to a masonry wall with lag screws turned into expanding sleeves seated in holes drilled into the wall with a star drill. Use lag screws alone when attaching the canopy to a frame house. If desired, metal braces can be added as in the photo.

Edmund Jezuit, Chicago.

Adapter on Photo-Light Stand Holds Home-Recording Microphone

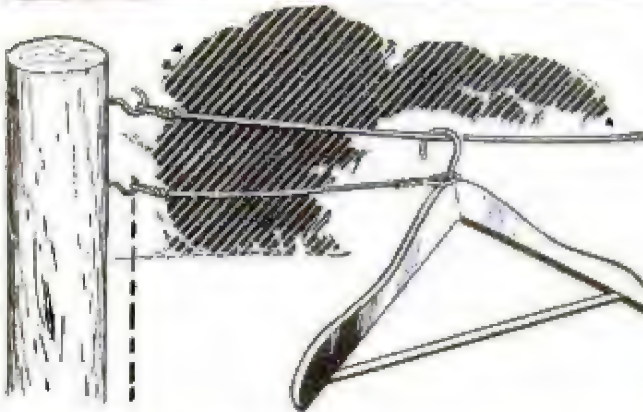


An inexpensive floor stand for a home-recording microphone can be made by mounting a special fitting on an ordinary photo-light stand. The fitting consists of a threaded reducer and a ball-type adapter used for attaching a clamp-on photo reflector to the stand. The ball tip of the adapter is cut off as shown in the upper detail and the reducer is soldered to the adapter as in the lower detail. The threads of the reducer should, of course, fit the microphone. After the fitting is turned into the base of the microphone, it is slipped over the tip of the light stand and tightened securely in place with the thumbscrew on the adapter.

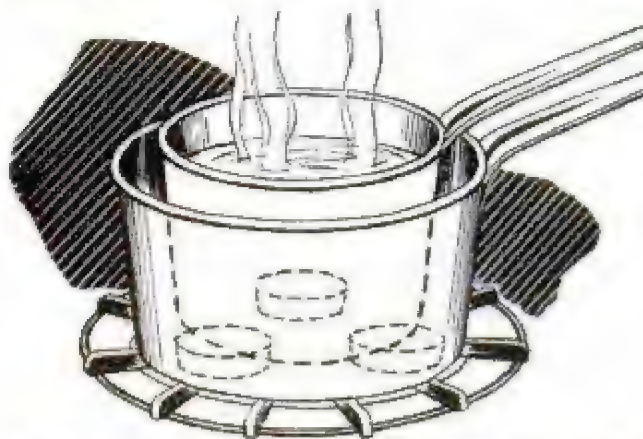


TILTING A FOOD GRINDER toward the bowl causes juices from the food to run into the container instead of dripping to the floor. A pencil placed between the grinder and the table top does the trick

HANGING PICTURES with fishline is better than using ordinary cord when regular picture wire is not at hand, as fishline is the stronger of the two



GARMENT HANGER STAYS PUT on clothesline when tied with wire "leash." A loop is formed at each end of the wire, one being slipped over a screw hook turned in post and the other over the hanger hook

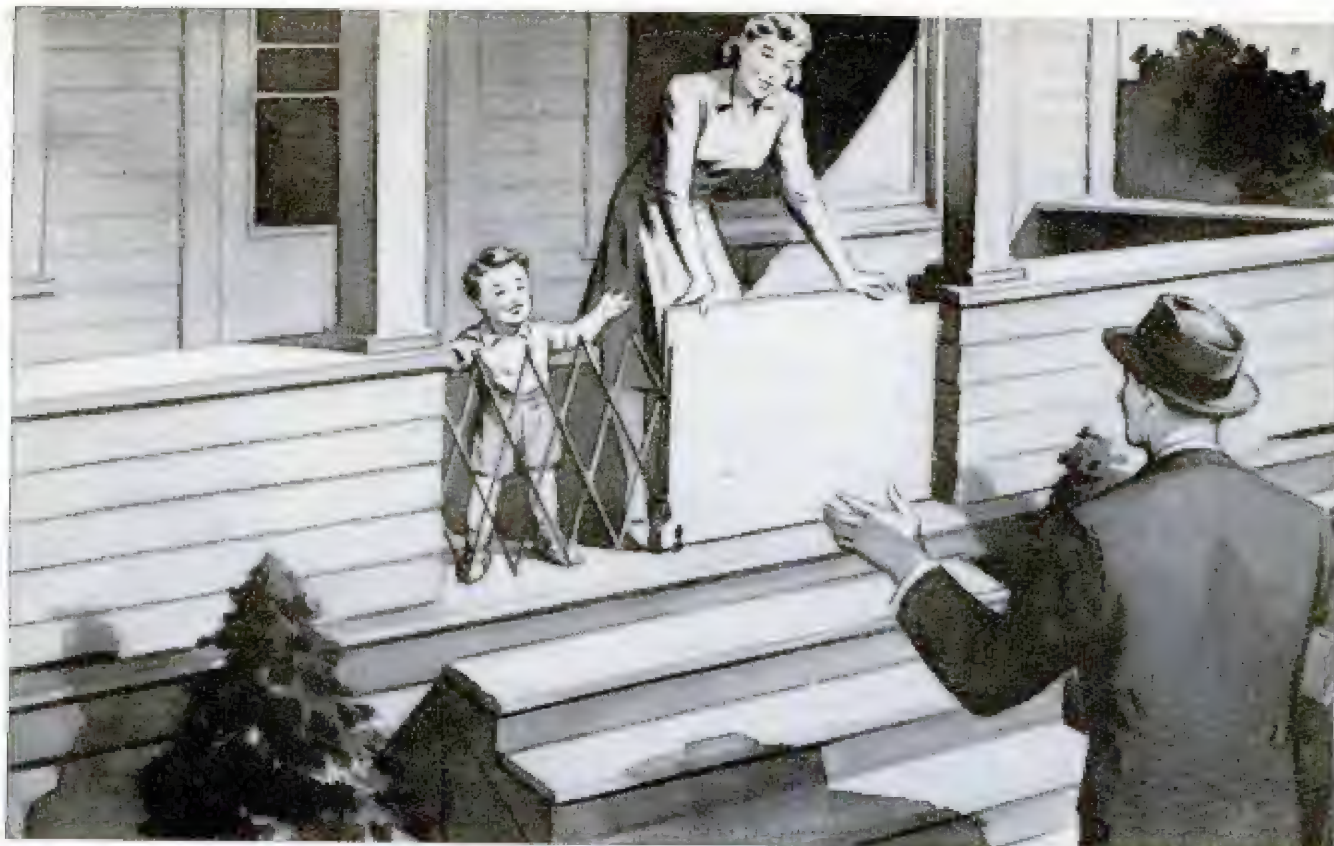


AN IMPROVED DOUBLE BOILER consists of a small saucepan supported on bottom of a larger pan with three fruit-jar lids. Large pan is filled with water

ELIMINATE SHINY AREAS ON CLOTHING by rubbing them with potato before pressing. Cut a piece from the potato and rub fabric with the sliced surface

OILCLOTH ROLLED FOR STORAGE won't stick together and damage the design if a sheet of tissue or wax paper is laid on the cloth and rolled up with it

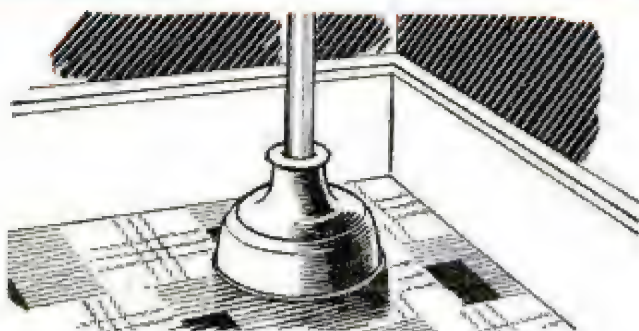




HOME PROBLEMS

SAFETY EXTENSION on folding gate closes large porch opening. Extension is a sheet of hardboard or plywood hinged to post. The gate is screwed to extension which is held to floor with screen-door hook

DRY PAINT SPOTS are removed from window glass by rubbing with a cloth moistened with hot vinegar. Use the vinegar full strength and heat it by setting the uncapped bottle in a saucepan filled with water



LAYING LINOLEUM is an easier job if a large suction cup, such as a drain plunger, is used to lift the corners. For a tight grip, rub soap on the cup edges

TO STRAIGHTEN PLASTIC KNITTING NEEDLES, dip in hot water and roll on a table top. Then insert them in a piece of corrugated cardboard and allow to cool



Segments Cut From Flanged Disk Provide Modern Drawer Pulls

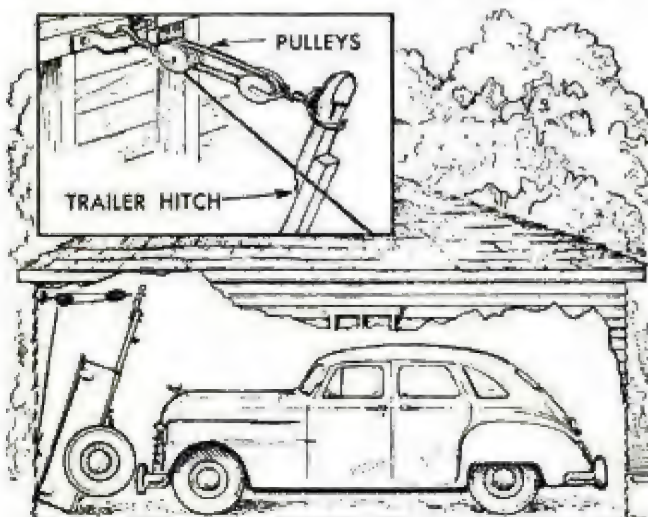


Turning a flanged hardwood disk on a lathe is a quick way to shape a number of modern drawer pulls. After the disk has been turned, it is cut into pie-shaped segments to form the individual pulls. The disk is recessed to produce a flange deep enough for a comfortable finger grip, and the radius of the curved faces of the pulls is, of course, determined by the radius of the disk. The edge of the disk can be grooved, chamfered or rounded while in the lathe to form a decorative effect. The pulls are attached with screws driven from the inside of the drawer fronts.

M. B. Birge, Hinsdale, Ill.

Trailer Held Against Garage Wall Requires Little Storage Space

Having to store my small trailer in a one-car garage presented a problem until I tried standing it on end against the rear wall. A

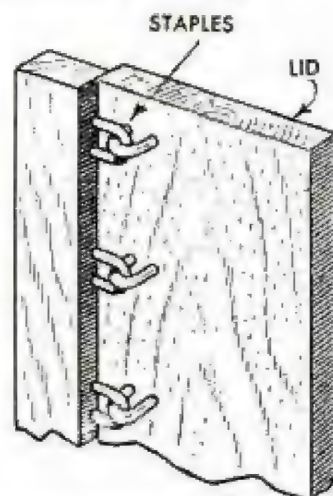


set of pulleys is used to raise the trailer into position and lower it when needed. Both the car and trailer fit nicely into the garage in this way. However, if the trailer is used infrequently, its wheels can be removed to afford more space for the car.

Fred Premo, Utica, N. Y.

Staples Form Temporary Hinge

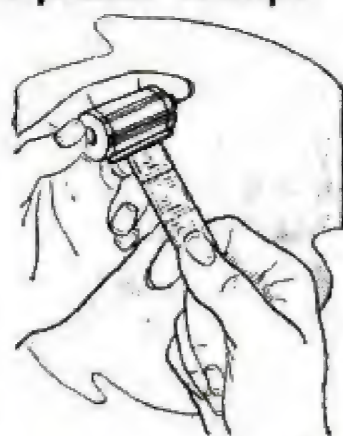
Where a hinge is only temporary and the parts do not have to fit flush, a "continuous hinge" can be made quickly by driving rows of staples in the wooden members. First, one row of staples is driven into the edge of the fixed member. Then another row



is driven into the face of the lid, or swinging member, so that a prong of each of the staples passes through one of the staples in the fixed member.—W. F. Schaphorst, Newark, N. J.

Film Cartridge Dispenses Stamps

The metal cartridge from a roll of 35-mm. film provides a handy postage-stamp dispenser which keeps the stamps both clean and dry. A roll of stamps is wound loosely around the core of the cartridge and the last one is pushed through the slot. Then the stamps are simply pulled from the dispenser and torn off just beyond the slot as they are needed.



Harry Radzinsky, Great Neck, L. I., N. Y.

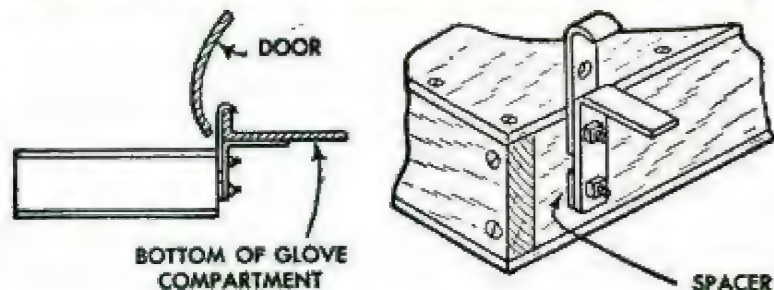
Eraser Clamps Furnish Propellers For Solid Model Airplanes

A small two or four-bladed propeller for a solid model airplane can be improvised from a metal eraser clamp of the type used on automatic pencils. The sides of the clamp are spread flat and trimmed to shape with a scissors or tinner's snips. Most of the clamps have a hole in the bottom, but some may have to be drilled for the propeller hub. A slight twist of the blades will provide the desired pitch.

Charles F. Dayton, Akron, Ohio.

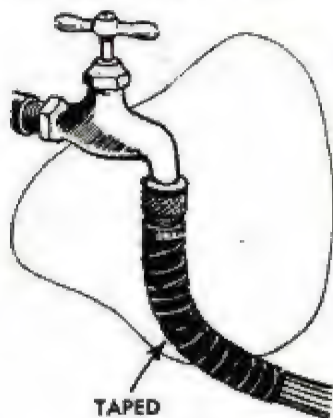
Dashboard Tray Increases Comfort on Long Trips

When driving your car on long vacation trips no doubt you have often wished for a flat, steady surface in the front seat—someplace where you could pour a cup of coffee from a Thermos bottle without doing a juggling act. If so, this little tray is just the thing. Hooked under the glove-compartment door, the tray provides an ideal place for setting cups and sandwiches plus a handy writing surface for jotting down notes or writing postcards while traveling. In addition, there is plenty of space between the top and bottom of the tray for road maps, guides and stationery. As the tray does not take up much room, it can be carried in the rear seat of the car when not in use. It also can be hung from the underside of the dashboard, if the design of the car permits. The tray is simply constructed of solid stock and plywood and can be painted to match the interior trim of the car. Ordinary metal corners are bolted to the back of the tray to form mounting hooks and brackets, as shown in the detail. Pieces cut from the corners that are used to form the hooks provide spacers for the lower ends of the brackets. The tray hooks over the front edge of the glove compartment



and is held in the horizontal position by the brackets. In most cases, there will be enough space at the bottom of the glove-compartment door to permit hanging the tray. However, if there is not enough room, small slots can be filed in the bottom edge of the door to permit inserting the hooks. If done carefully, the slots in the glove-compartment door will not be noticeable.

Garden Hose Reinforced by Wrapping With Tape to Prevent Kinking



Repeated kinking of a garden hose near the faucet connection eventually breaks the hose and causes a leak. To prevent this, apply a tight spiral wrapping of friction tape around the hose so it extends a foot or so from the connection. Be sure

the tape wrapping is long enough to cover the place where the hose usually kinks when it is pulled. Another way to accom-

plish this is to slip a short length of larger diameter hose over the end of the garden hose. This also will reinforce it sufficiently to prevent kinking.

Bobby Pin Holds Brads For Easy Starting

Tiny brads and tacks which are difficult to hold with the fingers can be started easily if they are held in position with a bobby pin. Place the brad between the arms of the pin and, after it has been started, simply pull the pin loose.

☛ To renew the appearance of artificial flies, shake them in a sack of hot salt.



By W. Allphin

TO REPLACE an average-size reed chair seat, you'll need about one pound of oval-split reed, which can be purchased from a dealer in seating materials. The reeds must be soaked in water for at least a half hour before using. Tack two strips to the front rail as shown in Figs. 1 and 3. Go under the front rail, over the adjacent side rail,

Warp is begun by tacking two reeds to front rail

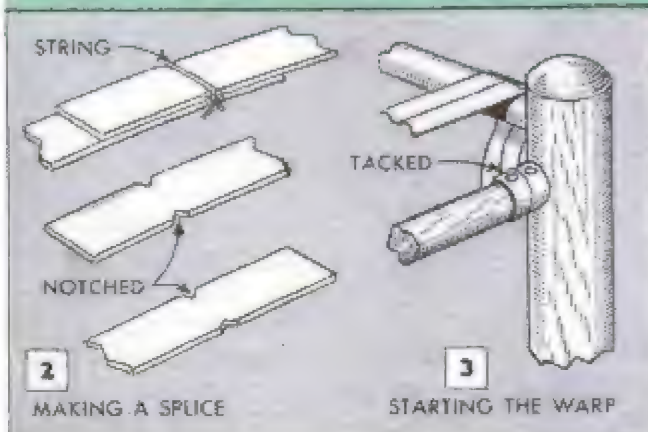


The completed seat is singed with the flame of a tightly rolled newspaper to remove the reed fibers

and then across to the opposite side rail. Wrap both strips around this rail and make an extra turn around it before returning the warp underneath to the first side rail. Make an extra turn here and go across the top again, as in Fig. 4. Each time you come to a rail, wrap an extra turn of the warp around it firmly before returning to the other side of the seat.

When near the end of a warp strip, shorten it if necessary so that it will end on the underside of the chair. Notch the edges of the old and new strips as in Figs. 2 and 5, and tie with string. A temporary tie is

Detail below at left shows how reed splice is made



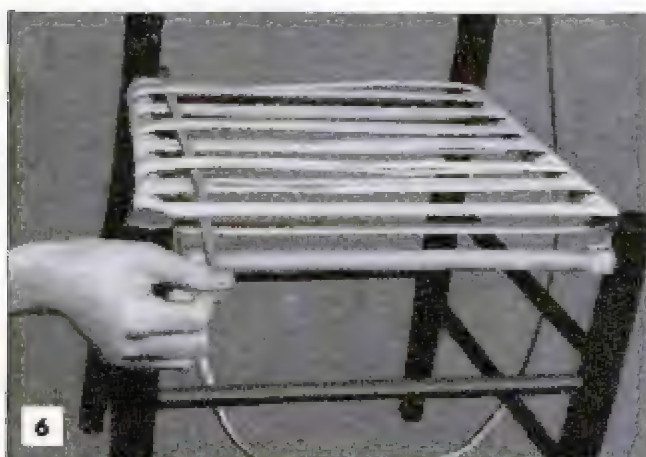
A REED-BOTTOM CHAIR



Warp strands are given one turn around side rails



Splicing warp strands is done on underside of seat



Woof strands are passed over and under warp strands

made around the rail at the last turn, as shown, to hold the strips while they are being spliced. Crowd the turns a bit wherever necessary so that the last warp on the upper side is back as far as possible. Start the woof across as a single strip at right angles to the front rail. This will leave a triangular space at the side. Weave under two, over two and around the rail, as in Fig. 6. Tuck the new piece in on top of the old one for a distance equal to two pairs of warp strips, as in Figs. 7 and 8.

Weaving woof is fun, just over two and under two



Woof is spliced by tucking end under warp strands

When you have completed the square area, fill in remaining areas along the side rail as in Fig. 9. Start a short piece by pushing it into the smallest opening through which it will pass, and weave it around to the bottom, finishing by cutting off the strip and tucking in the end. Repeat with a shorter strip until the area is filled. Let the reeds dry overnight and then singe off the loose fibers. Be careful not to scorch the reeds. Singeing can be done with a newspaper torch.

Fill-in areas at sides are woven with short strands



These Special Baits Are Sure To Tempt Carp



TAKING carp on light tackle with specially prepared baits is a novel fishing experience, particularly when you remember that the food preferences of the carp are unlike those of any other fresh-water fish. Carp are what fishermen call bottom feeders. They frequent the still backwaters of ponds, small lakes and sluggish streams where they regularly forage for food on the mud bottoms of these silt-laden waters. Thus, any baits offered must be fished deep in the stream or pond. This means that the first tackle requirement is a small hook tied close to a fairly heavy sinker so that the baited hook will go straight down from the surface of the water and will remain more or less stationary. Most carp fishermen use an adjustable float to hold the baited hook at a constant level, but others prefer to fish with a taut line. One of the baits rated highest among experienced carp fishermen is an ordinary marshmallow cut three ways with a sharp knife. If this is done carefully, you get eight pieces of just the right size. These should be kept in a closed container to prevent drying out. Another good bait is made by boiling licorice root, 2 oz., and aniseed, $\frac{1}{2}$ oz., in water, 1 qt. Continue boiling the liquid solution until it is reduced to about 1 pint, then strain and stir in sugar, $\frac{1}{2}$ cup, and enough flour to make a stiff, rubbery dough. Mold the dough into small baits and drop these into boiling water. When they rise to the top, remove and store in a tight container. Another long-lasting bait is prepared by first wadding small bait-sized balls of cotton. Melt grated cheese,

$\frac{1}{2}$ cup, in a shallow container and immediately drop in the wads of cotton. When the cotton wads have absorbed all they will of the melted cheese, remove and place them on a piece of board or in a shallow pan to harden. As soon as the baits have hardened, store in a tight container. Two other baits the carp fisherman keeps on his list are corn hominy and small squares cut from a ripe tomato and, if he should run out of bait entirely on a day when the fish are biting especially well, he remembers to search the edge of the stream or along the shore of the pond or lake until he finds a moss-coated log or stone. A small wad of the wet moss is excellent carp bait.

R. A. Jenkins, St. Louis, Mo.

Box 42

Armload of Books Carried Easily

When carrying an armload of books back and forth to school or to the library, they can be held without tying by interlocking the covers. Stacking the books one on top of the other and slipping the cover of one of them under the cover of the next, forms a neat "package."

John E. Sullivan, Springfield, Mass.

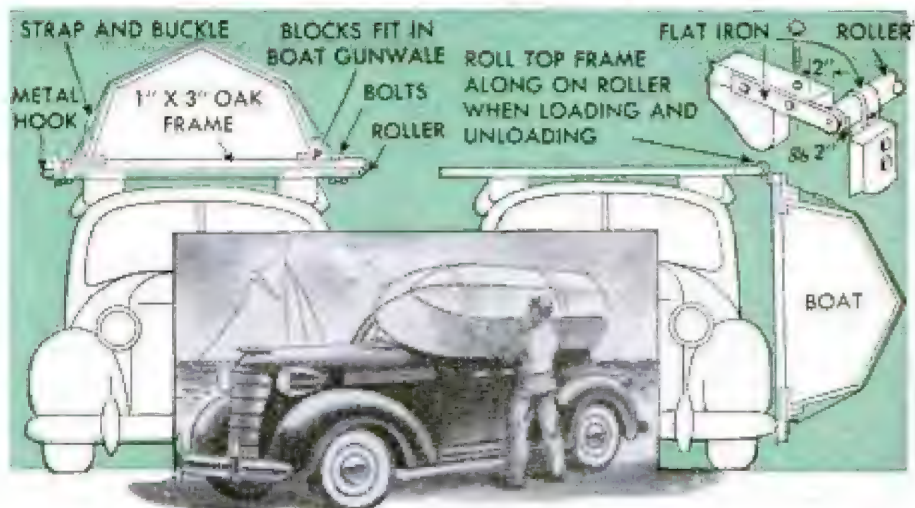


Windows glisten if washed with a solution of witch hazel, $\frac{1}{2}$ cup, in warm water, 1 qt., polishing with a lint-free cloth.

Loading and unloading a small boat from a rack on top of a car becomes a one-man job when this roller-type carrier is used. The carrier consists of two wooden frames. One of them is strapped permanently to the car in the usual way and the other is detachable. The boat is strapped to the second, detachable, frame which is fastened to the top of the first frame with bolts and wing nuts. A metal roller is mounted on one side of the bottom frame and extends its full length.

To remove the boat from the carrier, the top frame is pulled over the roller and swung downward along the side of the car. Flat-iron hooks attached to the far side of this frame engage the roller and keep the boat and frame from falling to the ground. Both frames are made of hardwood to the

Car-Top Carrier Fitted With Roller Permits Easy Handling of Light Boat



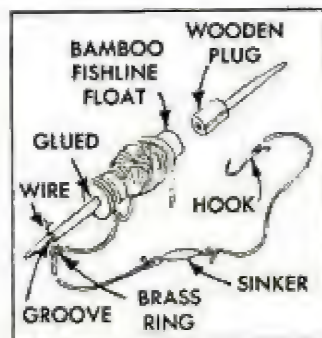
same size, and the roller can be merely a length of pipe rotating on an iron rod. The ends of the rod, which should extend through the endpieces of the frame, are threaded and the rod is tightened in place by drawing up nuts at the ends.

Ray C. Edwards, Wauwatosa, Wis.

Pocket Kit for Young Fishermen Carries Necessary Equipment

Small boys who like to keep fishing equipment handy won't tear their trouser pockets with loose fishhooks if the hooks are stored in a hollow bamboo float. Winding a line, with a sinker attached, around the float provides a compact pocket kit that contains all necessary items except bait. The bamboo is cut through the joint so the bottom end of the float is solid, and the top end is capped with a wooden plug. Pointed wooden stems are pressed tightly into holes drilled in the bottom of the float and in the plug. The line is passed through a brass ring, wired to the bottom stem.

C. L. Meehan, Lakeview, Ont., Can.



Portable Small-Parts Tray Utilizes Milk Cartons



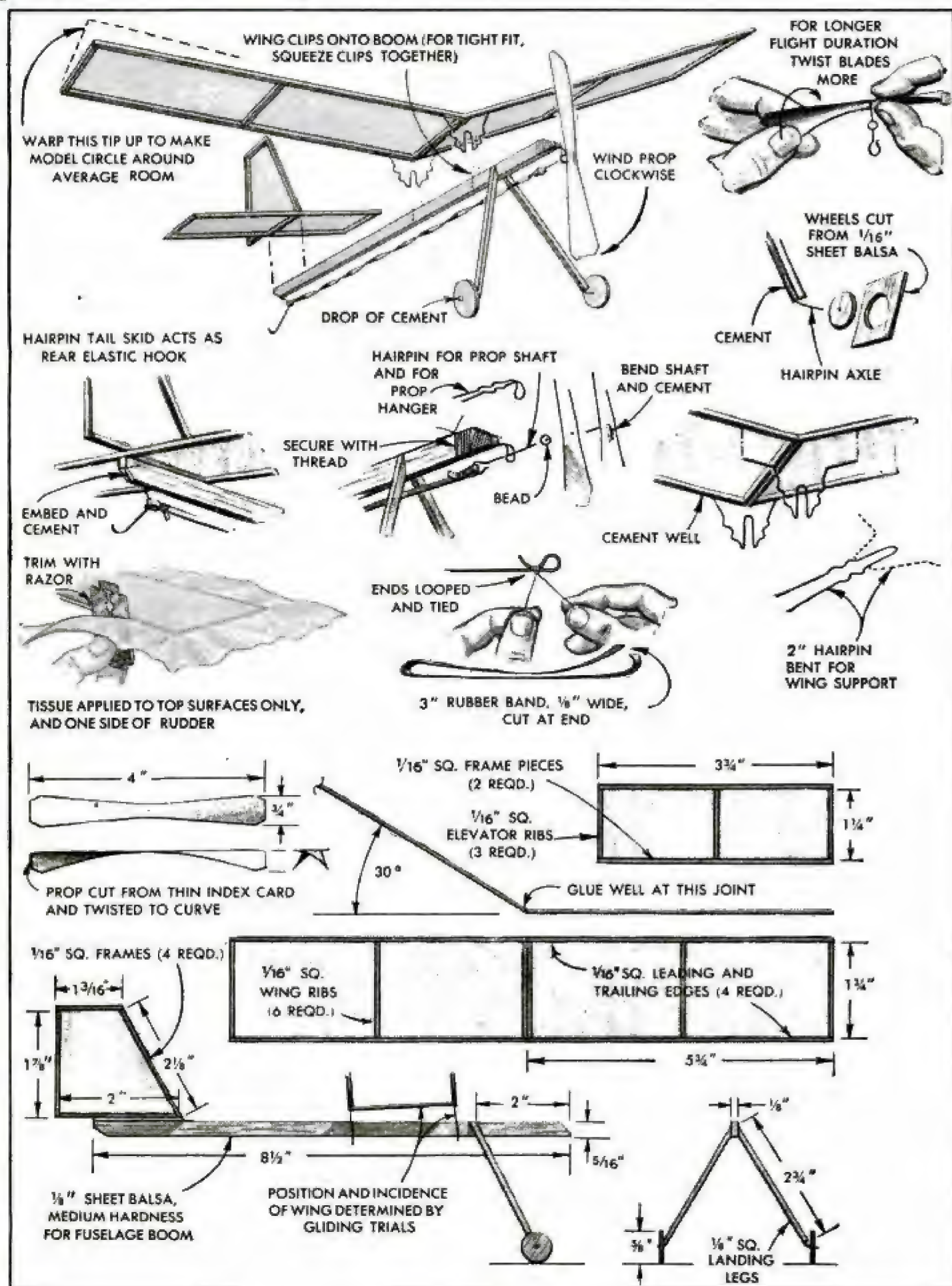
This simple wooden box having eight or more individual containers is just the thing for carrying nails, screws or other small parts. The box is made from scrap lumber and a length of

dowel or broomstick provides a handle. The containers are formed by cutting the tops from milk cartons and standing the lower portions in the box.

Driving Tent Stakes to Hold in Wind

Tent stakes will be less likely to pull loose from the ground on a windy day if two of them are driven together to form an X. In this way, the pull of each rope is evenly divided between two stakes, affording double the usual amount of holding power. — Edward Stevens, Michigan City, Ind.







By Henry Clark

BRIGHTEN up those dull evenings and rainy Sunday afternoons by flying Giggle-Getter for your little boy or girl. Too light to do any damage, the tiny plane is ideal for staging an impromptu air show right in the living room, and its ridiculous antics are sure to bring peals of laughter from the whole family. You can build Giggle-Getter in an evening—its construction is that simple. Only materials needed are several balsa strips, a piece of sheet balsa, an index card, some tissue paper and cement. The tissue is attached to the frames with flour-and-water paste and the edges are trimmed with a razor blade. Use hairpins for the fittings and a rubber band to power the plane. With the prop fully wound, the plane will make as many as three circuits around a large living room. Before winding the motor, check the flight characteristics with a few glides, moving the wing forward or backward and adjusting its angle to obtain the best flight path.



Magazine Pages Removed Neatly

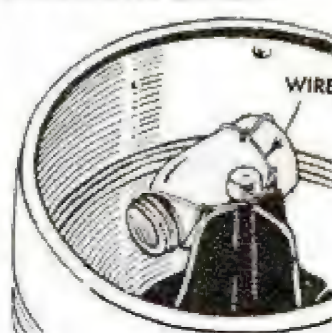
Using a razor blade or a knife to remove a page from a magazine often results in mutilating the text or details on the page being removed and also cutting into the adjoining page. However, this can be done neatly and without damage to adjoining pages by passing a loop of thread over the page and pulling it as shown.



Andrew Vena, Philadelphia, Pa.

Washing Machine Churns Butter

A washing-machine agitator comes in handy to churn a small amount of butter. The cream is poured into a glass jar which is tightly capped and then wired to the top of the agitator. The wires can be fastened so the jar will not slip out when the machine is in motion by looping one wire around the neck of the jar and another around the jar near the bottom. A third length of wire is secured across the bottom of the jar. Finally, a wire bail, which is slipped over the top of the agitator, is attached between the two loops.



Wayne A. Ward, Watertown, N. Y.

Tab Fastened to Car-Door Switch Keeps Interior Lights Off

When the interior lights of a car are operated by automatic door switches, they, of course, will stay on as long as the door is open. If the door is left open for an extended period of time, the lights are likely to run down the battery. To avoid this when working on the car or sending it to a garage for repairs, simply attach a sheet-metal tab to the switch plate, fastening it with the lower screw so it is loose enough to be moved. The tab is swung over the switch button to keep it depressed when the door is open and moved out of the way when not needed.

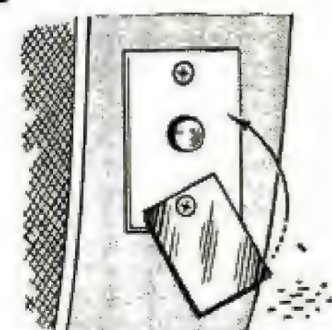
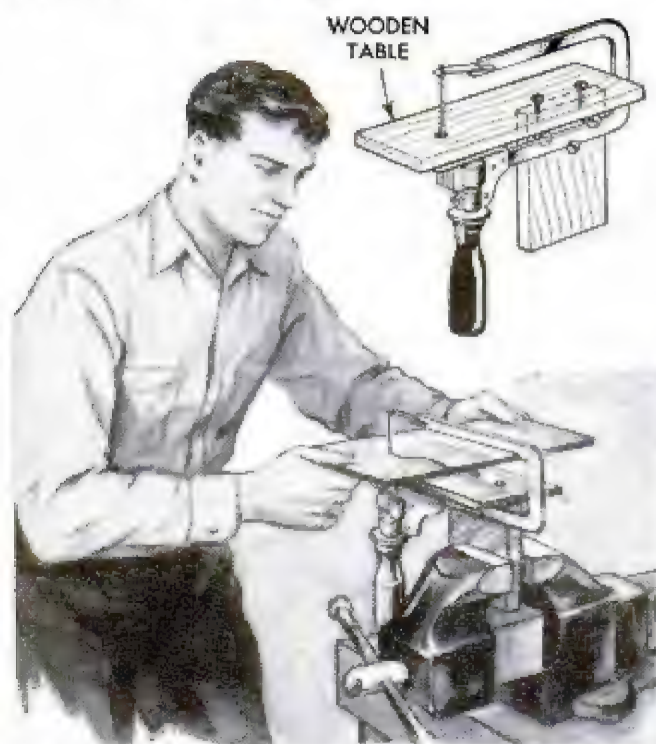


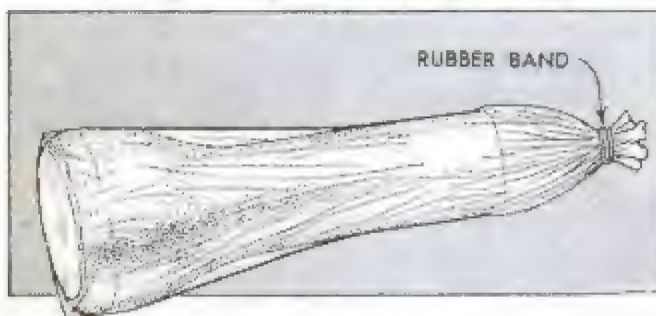
Table on Electric Coping Saw Permits Mounting in Vise



To increase the usefulness of an electric coping saw and insure a right-angle cut, one craftsman fitted a plywood table to the saw and clamped it in his workbench vise. Thus, he can use the tool as a table-model jigsaw and guide the work with both hands. A hole for the saw blade is drilled through the table and the latter is screwed to a block of wood which is clamped in the vise. Three roundheaded screws driven into the side of the block hold the saw frame in place. A piece of sheet metal screwed loosely to the saw handle holds the trigger-type switch closed, and is swung out of the way to release the switch.

Steven Morenoc, Fall River, Mass.

Food Bag Keeps Flashlight Dry



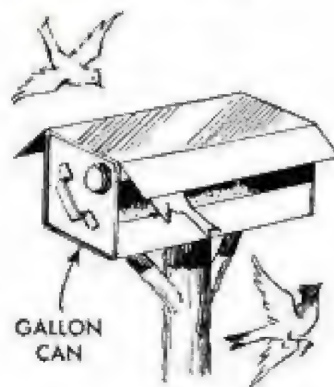
Before going on a fishing or camping trip, enclose your flashlight in a Cellophane food-freezing wrapper or a transparent-plastic food bag. This will keep the flashlight watertight for use in the rain and, even if it is dropped from a pier or boat into shallow water, it can be retrieved in perfect condition. Wrap the bag or sheet

of Cellophane around the flashlight and secure the end tightly with a rubber band. The switch can be operated through the covering without damaging it.

Bird Feeder From Gallon Can

Dry feed in all kinds of weather is a distinct feature of this bird feeder made from a gallon can. Opposite sides of the can are cut in half lengthwise, and the upper halves are bent outward to form awnings. Sharp edges of the can should be folded over or filed smooth. The feeder is mounted on the top of a post.

Victor H. Lamoy, Upper Jay, N. Y.



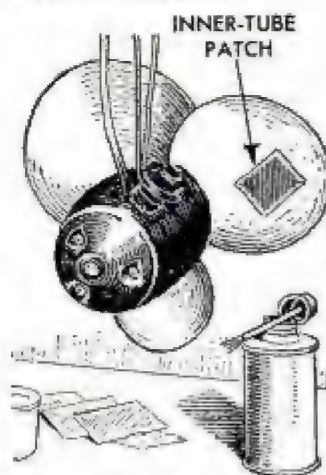
Lasting Filler for Wood Cracks

For filling cracks or holes in wood, I use a mixture of sawdust and resin glue. This provides a lasting repair which can be painted successfully. Use fine sawdust, preferably from a sander, and stir it into the glue until the mixture is the consistency of putty. Then work the filler into the crack, leaving it raised slightly above the surface, as it tends to shrink.

S. H. Winchester, St. Petersburg, Fla.

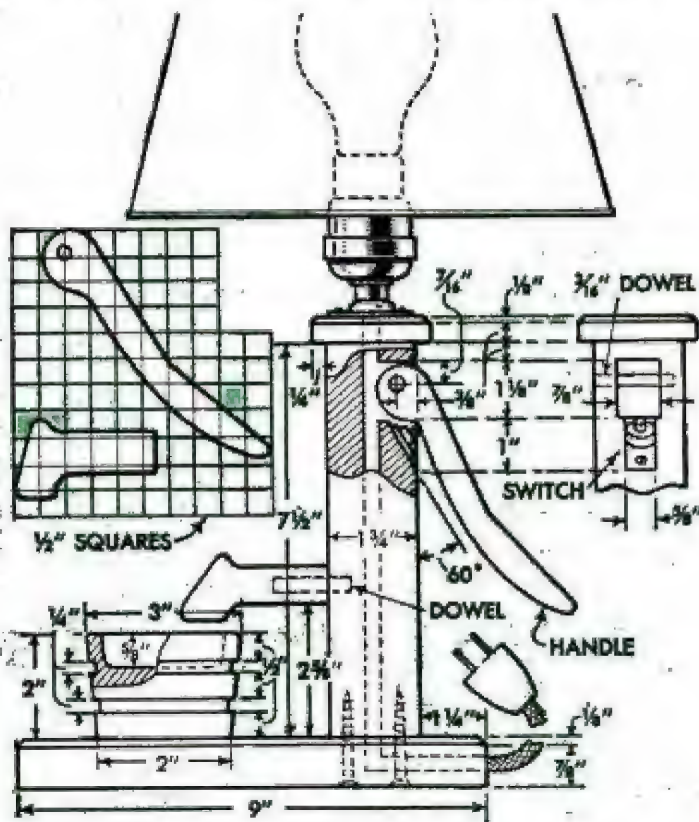
Balancing Rubber Fan Blades

Vibration of a rubber-bladed ventilating fan in a car can be reduced or completely eliminated by balancing the blades. To do this, temporarily attach an inner-tube patch to first one blade and then another, checking the balance of the fan until an improvement is noticeable. After the "light" blade has been determined, try placing the patch at various distances from the fan hub. When the patch is located in a position at which the fan runs most smoothly, permanently fasten the patch to the blade with rubber cement.—Ed Packer, Chicago.



House plants can be prevented from growing lopsidedly by turning them frequently to expose opposite sides to the sun.

Well Pump Modeled in Walnut Forms Lamp Base

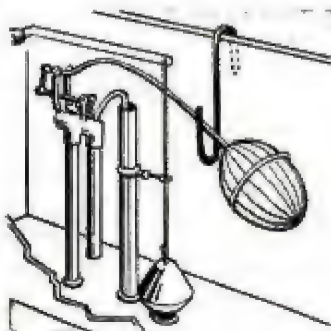


A scale replica of an old, wooden well pump forms the attractive base of this reading lamp. As will be seen from the construction details, pressing the handle turns the lamp on and off. Select a grainy square of walnut for the column, and center a $\frac{1}{16}$ -in. hole through it lengthwise to permit passage of the lamp cord. Jigsaw the handle and spout from $\frac{1}{2}$ -in. walnut stock, using the squared pattern as a guide. Then mortise the column for the handle and run a chisel cut into the bottom of the mortise at a 60-deg. slant to form a mounting pad for the switch. Make the base from 1-in. walnut 5 in. wide and 9 in. long. Chamfer the top edges and drill two $\frac{1}{16}$ -in. holes at right angles for the lamp cord as indicated

by the dotted lines. Make the weather cap for the top of the pump column from $\frac{3}{8}$ -in. stock and drill holes in the cap for the cord and screws holding the flange-mounted socket. Before assembling the parts, pass the lamp cord through the base and column and wire the switch and socket. Then dowel the spout to the column and screw the column to the base. Pivot the pump handle on a small dowel and, finally, turn the water tub from walnut to the dimensions indicated. If desired, the tub can be scored to simulate staves. Fill the wood with a walnut-colored filler. Follow this with a coat of white shellac, and then finish with paste wax polished to a soft sheen.

I. M. Fenn, Chicago.

Hook Bent From Wire Coat Hanger Eliminates Flush-Tank Leak



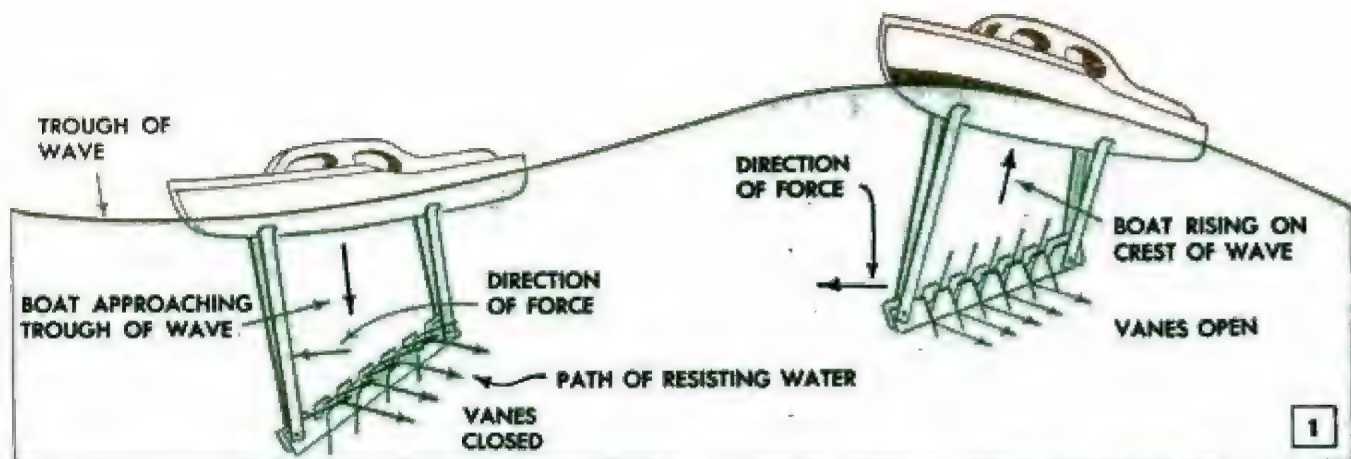
If a flush tank leaks persistently even though the parts and working action seem to be in good condition, the trouble may be caused by the float interfering with the seating of the ball valve at the bottom of the tank. When this is the case, it can be corrected by means of an S-hook bent from a wire coat hanger. The hook, which is hung over the side of the

tank, is bent so that it stops the float when the latter has dropped far enough to open the inlet. However, the hook keeps the float sufficiently high to prevent interference with the movement of the ball valve.

Aluminum Foil Speeds Ironing

Spreading a sheet of aluminum foil over the ironing-board pad before tying down the cover speeds ironing considerably. The metal keeps the moisture in sprinkled clothes, reflects heat from the iron and thus helps to produce steam.

D. M. Gwinn, Anderson, Ind.



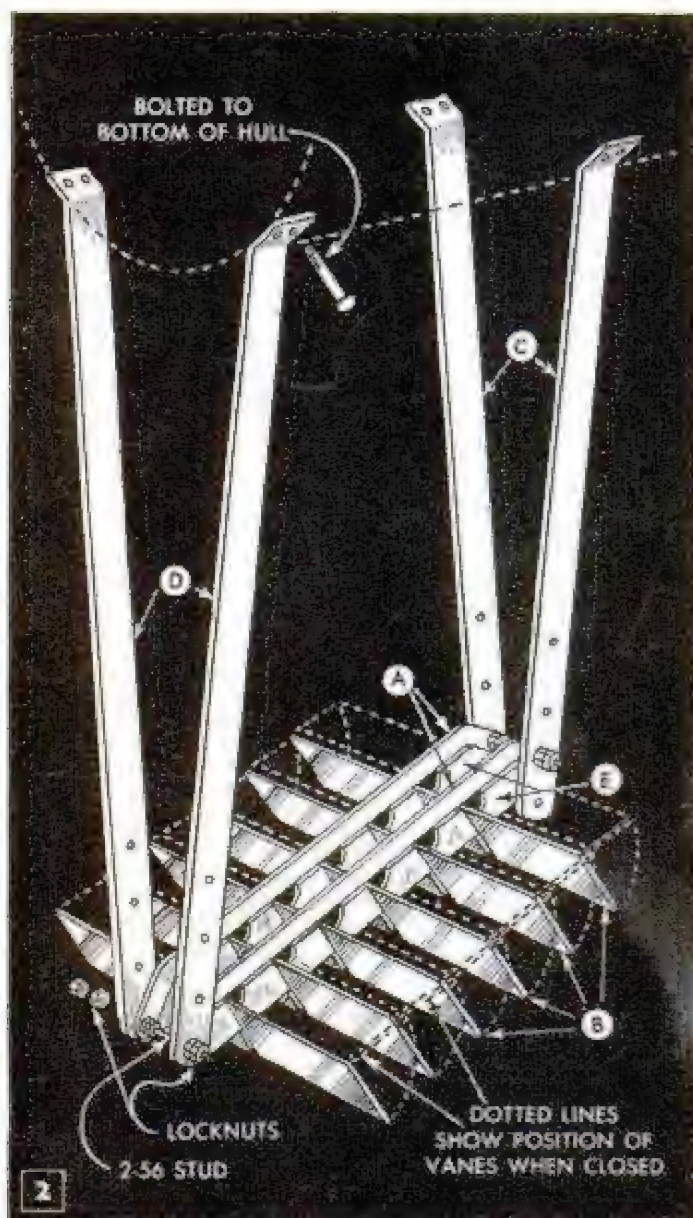
This "wave motor" drives a 3-ft. model boat at rowboat speeds in a light fresh-water chop. There are no springs to wind, no sails to trim and no need for a keel or rudder



WAVE-POWERED

By Austin H. Phelps

YOUNGSTERS and grownups alike will get a thrill out of the performance of this model-size wave-powered boat. The hull is made from balsa wood and is scaled down to about 36 in. in length using as a prototype almost any design that strikes your fancy, from a submarine to an ocean liner. However, models with a comparatively low, streamlined superstructure give the best performance as this type offers less wind resistance. Fig. 1 shows how the "motor" works. Wave movement diminishes a short distance below the surface and, if an inclined plane is suspended in this comparatively still water, it will be drawn upward as the boat crests a wave. The inclination of the plane surface (in this case, the metal vanes), acting against water resistance, propels the boat forward as in the right-hand detail in Fig. 1. As the boat passes the crest and approaches the trough, the vanes close or, in effect, reverse, and the propelling forces act on the opposite surface of the vanes. As the boat reaches the trough, the vanes automatically reset to the open position and the cycle repeats. Thus, the wave motor, Fig. 2, is simply a series of inclined vanes, B, supported by the struts C and D, which are attached to the bottom of the boat. The parts A, B, C, D and E in Fig. 2 are detailed in Fig. 3. Cut the vanes, part B, from half-hard sheet aluminum, .0159 in.

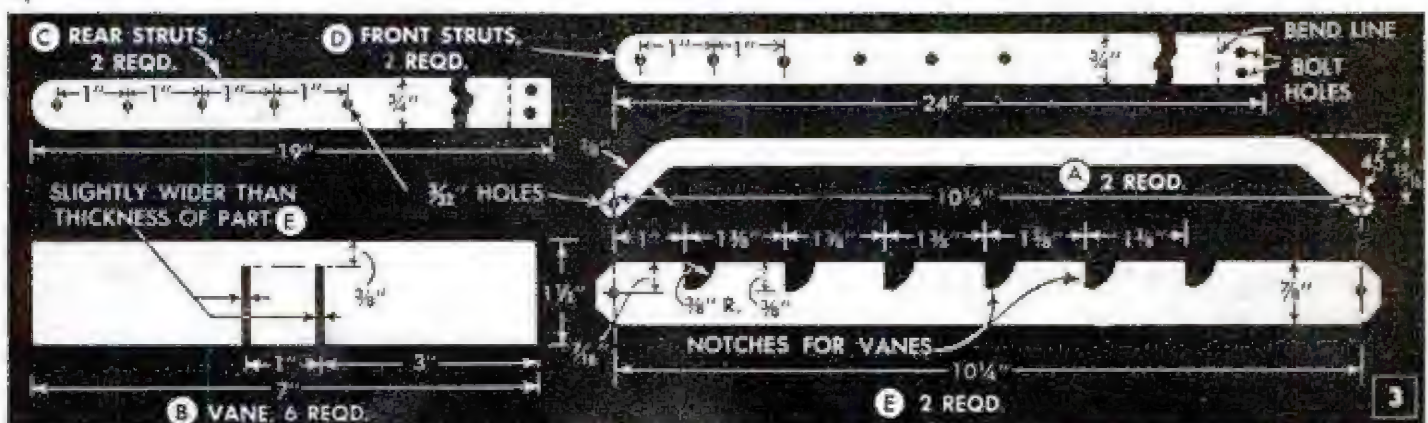




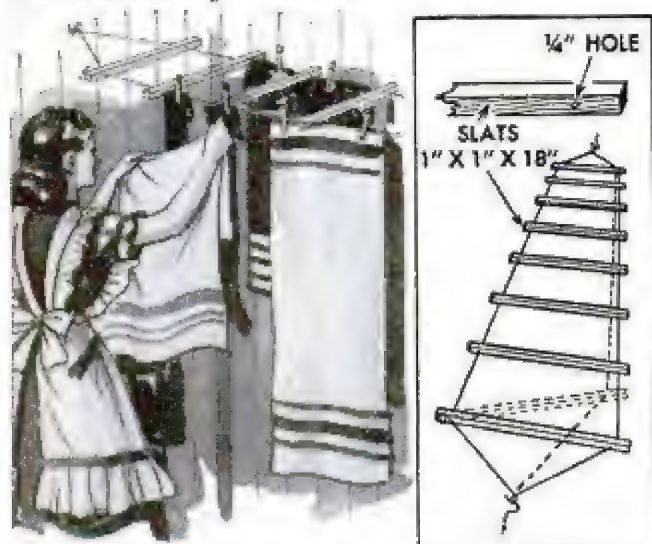
MOTOR PROPELS MODEL BOAT

thick (26 B & S gauge). Care should be taken to cut the vanes to exact size, particularly the width, so that they will overlap slightly when in the closed position. Remove all burrs from the cut edges. If the vanes are bent slightly in the cutting operation, hammer them flat with a soft mallet. The same care should be taken in cutting the notched parts E to duplicate dimensions. Use half-hard aluminum .0640 in. thick (14 B & S gauge) for these parts. The notches can best be cut with a hand scroll-saw or coping saw fitted with a fine-toothed blade. File out the saw marks and smooth the curved edges of the notches with fine emery cloth. Parts A can be cut from the same material as parts E, or they can be cut from $\frac{1}{8}$ -in. aluminum as are the front and rear struts, parts C and D. Bend the ends of the parts A to a 45-deg. angle as shown, hammer the bends flat if necessary, and drill all holes indicated on parts C, D, A and E. Now the motor is ready for a trial

assembly. Make studs by cutting 2-56 threads on each end of a 2-in. length of $\frac{3}{32}$ -in. brass rod. Assemble the parts as in Fig. 2, using eight brass locknuts on each stud. The important thing is to make sure by trial assembly that all vanes open and close fully, and that each one moves freely without binding at any point. Unless the error in hand cutting has been considerable, the vanes can be adjusted for free movement merely by changing the position of the locknuts. Shifting the locknuts slightly either way along the threaded ends of the studs will vary the distance between the parts E. After it is correctly adjusted, attach the assembly to the hull with 2-56 brass bolts which pass through the bottom of the hull and are held with nuts turned down on large washers to prevent cutting into the soft wood. The vane assembly should center under the hull at a point just aft of midship. Experiment a little to find the correct position of the vanes.



More Room on Indoor Clothesline Provided by Wooden Slats



Where washing must be hung on an indoor clothesline in a limited amount of space, more clothes can be hung in the same area by using wooden slats to separate a double line. In this way, additional clothes may be hung over the slats and the two lines can be supported by one hook at each end. Holes should be drilled about 1 in. from the ends of the slats so the clothesline can be threaded through them. To balance the clothesline, adjust one of the end slats as indicated by the dotted lines.

John P. Gillese, Edmonton, Alta, Can.

Insulated Toggle-Switch Extension Improvised From Fuller Ball



An ordinary fuller ball pressed over the end of a toggle switch provides an extension which makes the switch easier to operate. This is especially handy on power tools, as the switch can be snapped off quickly

in case of an emergency. In addition, the ball forms an insulated finger grip to eliminate the danger of shock.

Richard Hanscom, Elmhurst, Ill.

Refinishing Plastic Novelties

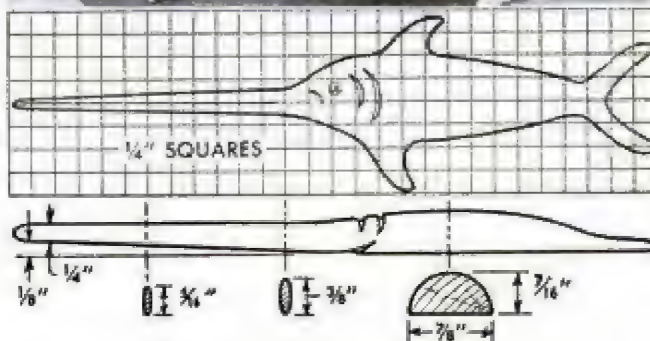
If plastic book ends, picture frames and trinkets have become scratched and dull, their original luster can be restored by sanding and polishing. Using wet-or-dry sandpaper, begin with a coarse grade (for deep scratches) and progress through two or three intermediate grades to the finest one. If the object merely looks dull be-

cause of minute scratches, the finest grade alone will be satisfactory. Rinse the object with water between the sandings. After sanding, polish the surface with a commercial buffing or polishing compound, pumice or tooth powder, using a moistened pad of soft cloth for an applicator and rubbing vigorously with a circular motion. Finally, wash away all traces of the polishing compound and apply a wax polish with a clean, soft cloth. This fills in any remaining scratches and is a protective coating.

Robert Hoppough, Waukegan, Ill.

Swordfish Paper Knife in Hardwood Forms Attractive Desk Accessory

This little swordfish opens your mail with its beak. Carved from hardwood, its body forms a novel handle. After sawing a rough blank from a piece of walnut, maple or other fine wood, carve the fish with a sharp jackknife, smoothing with sandpaper and steel wool. The gills and mouth can be cut with a veining tool and the eye can be made in two ways. One is to form a $\frac{1}{16}$ -in.-deep socket with a $\frac{1}{8}$ -in. drill, using the head of a straight pin as the pupil. The shaft of the pin is first cut off so it is only about $\frac{1}{4}$ in. long and this is driven into the eye socket. The other way is simply to drill the eye socket deep enough to receive a white bead which is cemented in place. Before installing the eye, however, wax and buff the paper knife, being careful not to break the fins and tail.—Hi Sibley, Nuevo, Calif.



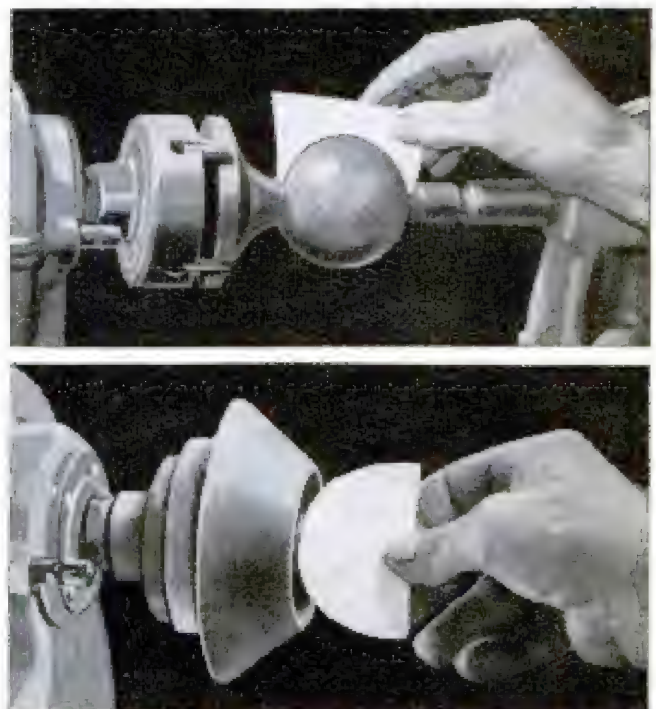
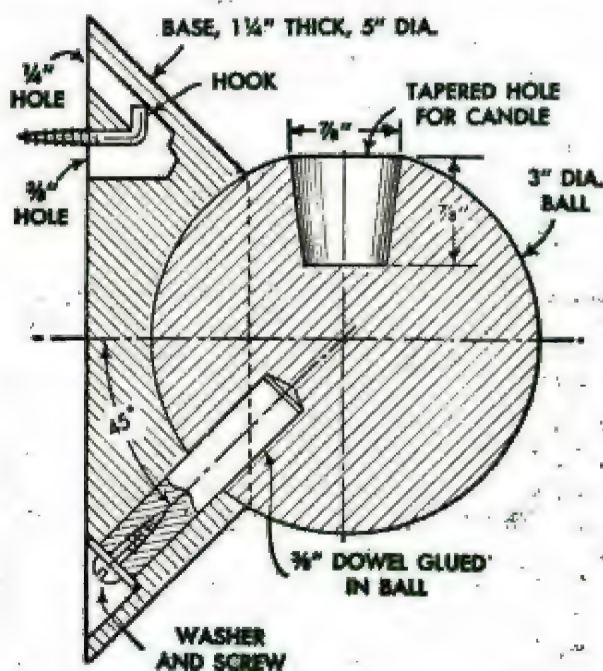
Two-Way CANDLESTICKS



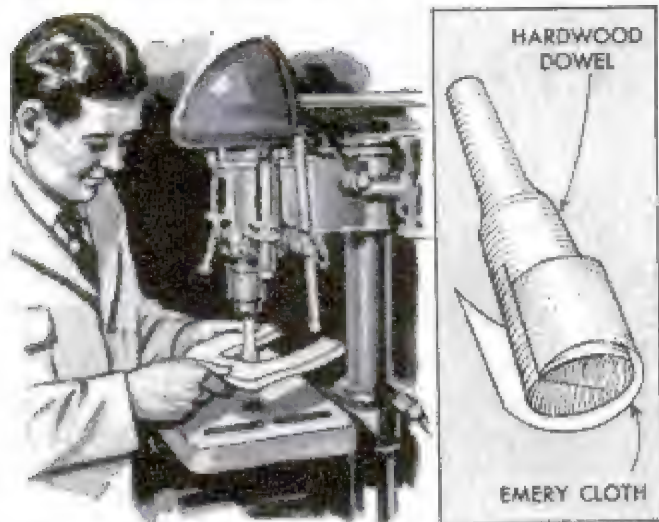
By **Benj. Nielson**

BY A SIMPLE half turn of the ball, which is mounted on a concealed pivot pin, these novel candlesticks are adapted for use either on a table or a wall. Turning them is an interesting job for the craftsman who likes to work at the wood lathe. Use a fine cabinet wood such as maple, walnut or mahogany. Turn the ball candle sockets first, using a special template made from heavy cardboard or thin hardwood. Work slowly, checking the work frequently to assure that the balls are turned to true

spheres. Drill each ball as indicated in the sectional view. The tapered hole forming the candle socket is drilled while the ball is still in the lathe. To finish the ball, apply a thin coat of shellac. Then immediately moisten a pad with alcohol and polish the work with the lathe running. Proceed in a similar manner when making and finishing the base, using a special template to bring the concave cut to exactly the same radius as that of the ball. Drill meeting holes from the bottom of the base to provide space for an L-hook, and counterbore for the pivot pin. Then glue felt to the base.



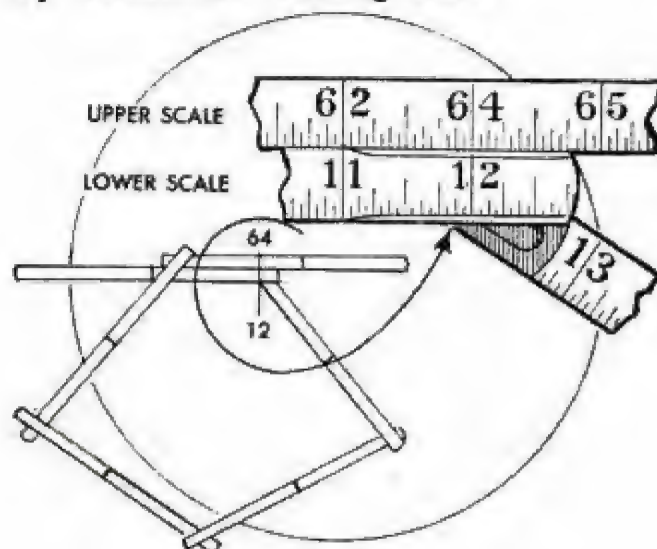
Dowel Chucked in Drill Press Serves as Spindle Sander



Chucked in a drill press, a hardwood dowel forms a spindle sander which is ideal for quickly smoothing the edges of intricate scrollwork. One end of the dowel is tapered to fit the drill-press chuck and the other end is slotted. Then a 1-in.-wide strip of emery cloth is inserted in the slot and torn off so that it completely encircles the dowel. If the cloth is mounted as shown in the detail, it is not necessary to glue it, as the clockwise rotation of the drill press will hold it in place.

Dick Hutchinson, El Monte, Calif.

Inside Measurements Taken Quickly By Means of Folding Rule



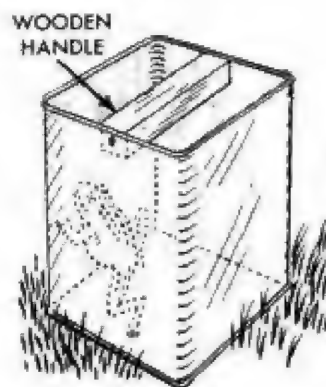
Using an ordinary 6-ft. folding rule, inside measurements can be taken quickly and accurately. This is especially handy when installing shelves in cabinets, measuring windows for screens or storm sash, etc. Simply fold the rule to form a circle, as shown, placing the ends against the sides of the cabinet or window frame. Then, using a reading on the lower scale as a refer-

ence mark, add this dimension to the difference between the dimension directly above it and 72 in. Thus, in the example, 72 in. minus 64 in. equals 8 in., and 8 in. added to 12 in. is 20 in., which is the distance between the ends of the rule.

Robert M. Barry, Chincoteague, Va.

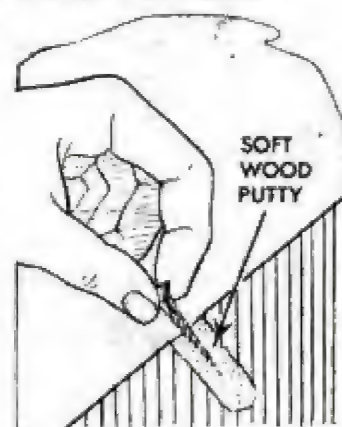
Trapping Frogs With Oilcan

Fitted with a wooden handle, a 5-gal. oilcan provides an excellent "net" for catching frogs. The top and bottom of the can are cut away and the handle is nailed between two sides at the top. When a frog has been sighted, the can is quickly slapped over it. The frog cannot jump out of the can because of the vertical sides and it is a simple matter to reach down into the can and remove the frog.



Renewing Screw-Hole Threads

When threads formed by a screw driven in a piece of wood have been stripped so that the screw no longer holds fast, they can be renewed by the use of wood putty. First, drill the hole slightly oversize and fill it with putty. While the latter is still soft, carefully turn the screw about half-way into the hole to make a perfect thread and remove it. Then, allow the putty to harden thoroughly and drive the screw into the hole, using the previously formed threads as a guide.



Stopping Outboard Motors Properly

Do not shut off your outboard motor while it is running at high speed as this results in fouled spark plugs and hard re-starting. Instead, slow the motor down to trolling speed for half a minute or so before stopping. This will burn out excess oil from the combustion chambers.

Raymond B. Lee, Daly City, Calif.

☐ Removing cigarette burns and stains from silver can be simplified by rubbing the juice of an onion over the stained portions of the surface with a soft cloth.

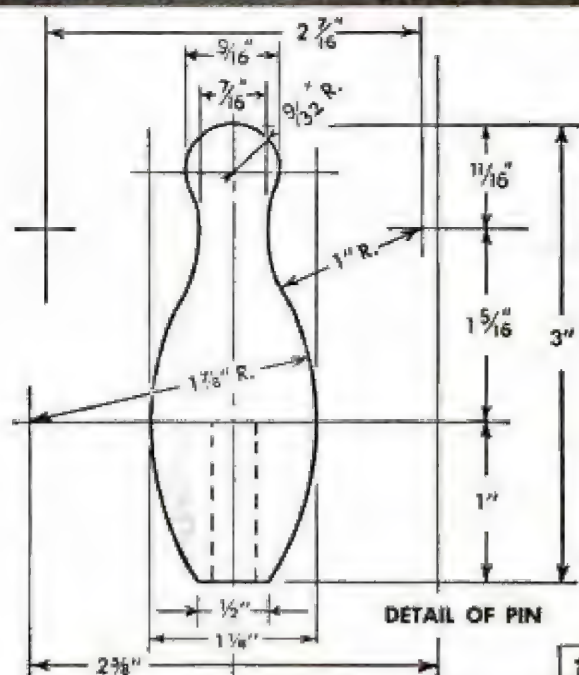
STRIKES AND SPARES *in miniature*



By R. DeWitt Miller

HERE'S regulation bowling scaled down to pint size. All items of the equipment, except the length of the alleys, are reduced to approximately one-fifth size, making the unit ideal for use in home playrooms. This reduction scale makes a golf ball just about the right size and weight for the miniature bowling ball, Fig. 3, and brings the pins down to a height of 3 in. and a maximum diameter of $1\frac{1}{8}$ in. To be in the same scale with the standard 80-ft. alley, the miniature alley would be 16 ft. long. However, the details in Fig. 4 dimension an 8-ft. alley which was found to be just as effective as the longer one in duplicating the conditions of play and is, of course, a more convenient length for the recreation room. Miniature bowling is scored in the same way as the regulation game, small score sheets being ruled on ordinary typewriter paper.

The alley bed is built up from two or more pieces of $\frac{3}{4}$ -in. stock, edge-glued, doweled and cleated across the bottom. The gutters are formed by $\frac{1}{2} \times 1\frac{3}{4}$ -in. strips assembled with an edging strip of $\frac{3}{4}$ -in. stock as shown in section B-B, Fig. 4. Note that these edging strips are 8 ft., $7\frac{1}{4}$ in. long, the $7\frac{1}{4}$ -in. extension on each side forming the frame for the pit. The sides of the pit are 5 in. wide and have both front and rear ends cut at angles as shown in

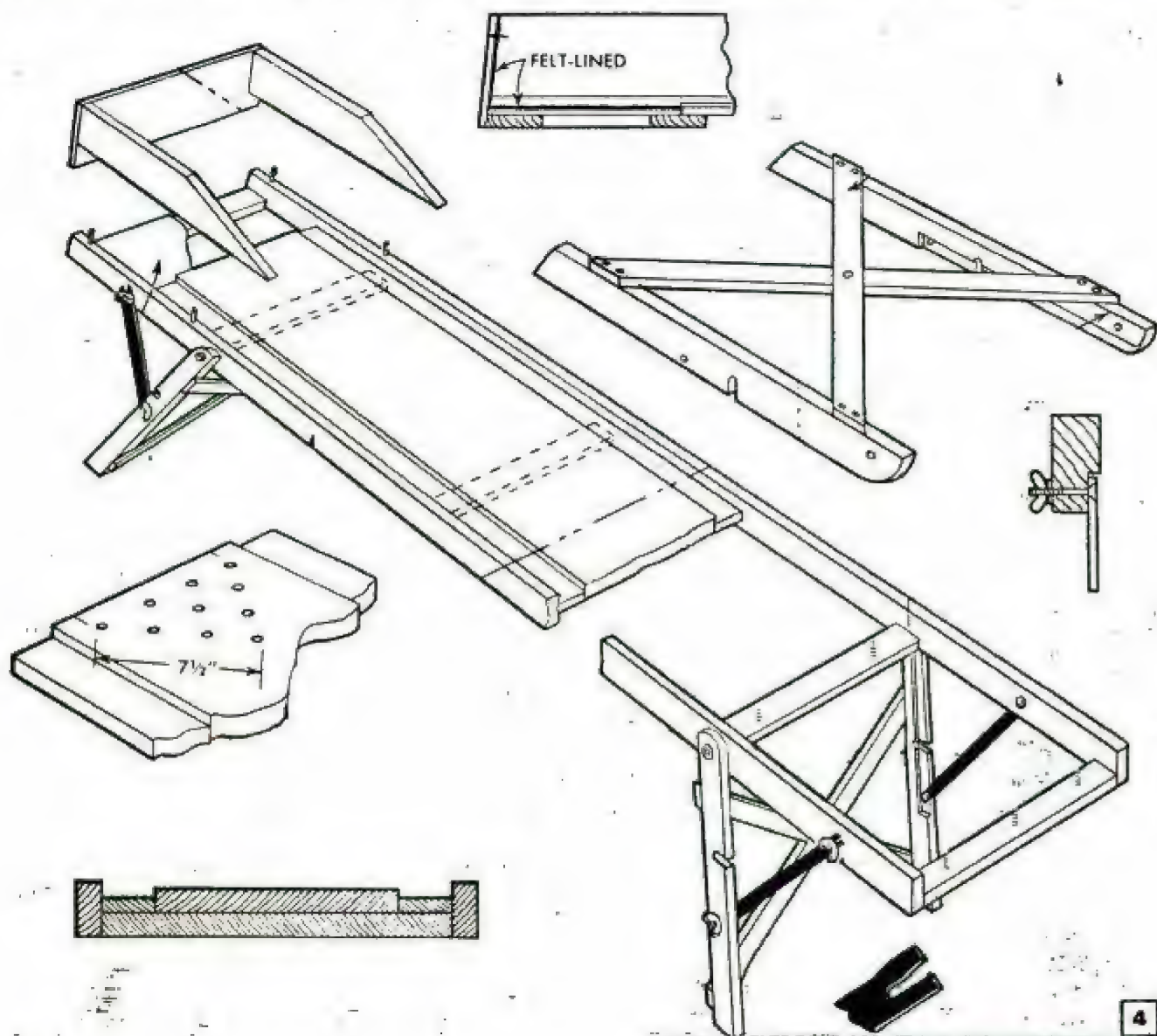




Above, photo illustrates the relative size of the miniature bowling ball and pins, with a possible strike in the making. Below, use selected hardwood for the alley and sand the surface smooth and flat

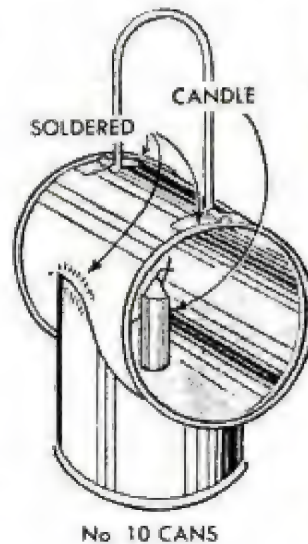
Fig. 4. Sides are doweled to the edge strips. Nail $\frac{1}{4}$ -in. plywood in the open frame to form the bottom of the pit and then cover the bottom, sides and the back with felt, section C-C. Before sanding the surface of the alley, locate the pattern for spotting the pins. Drill $\frac{1}{2}$ -in. holes about halfway through the alley bed and drive $\frac{1}{2}$ -in. dowels into the holes, cutting each one off flush with the surface. When sanded flush, the short dowels will finish somewhat darker than the alley, making it easy to spot the pins quickly.

The legs are X-braced to give lateral rigidity and individual metal braces fold flush in stopped rabbets cut on the inside corner of each leg as in section A-A, Fig. 4. This arrangement allows the leg assemblies to fold flat against the bottom of the alley. Turn the pins from hardwood to the dimensions given in Fig. 1 and drill a $\frac{3}{8}$ -in. hole in the bottom of each pin. Bring the pins to a uniform weight of 1 oz. by driving short lengths of $\frac{3}{8}$ -in. brass rod into the holes as in Fig. 2. A few drops of glue will hold the weights in place. Varnish and wax the alley, and paint the gutters black.



Boy-Scout Lantern Made From Tin Cans Uses Candle to Provide Light Source

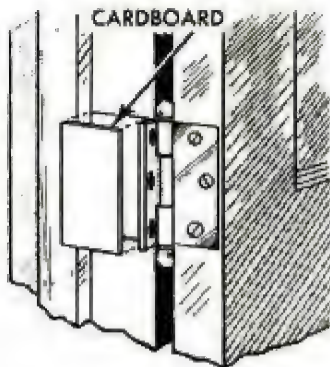
Taking one of these candle-burning lanterns on your next overnight camping trip will furnish extra light without wasting flashlight batteries. In addition to costing practically nothing, the lightweight lantern is easily carried and the candle is well protected from wind and rain. The lantern is made from two tin cans, one of them providing a base and the other, which is mounted horizontally, serving as a reflector to give a spotlight effect. The can forming the base is cut away so the other will fit neatly within its sides and the two cans are soldered together. The candle is held upright in the reflector by impaling it on a short nail which is driven through the side of the can and soldered in place. A wire handle is fastened to the top of the lantern by means



of a metal tab soldered near each end of the can. If an opening is cut in the side of the base can, spare candles and dry matches can be carried inside the lantern. This opening can be fitted with a metal cover.

Elmer A. Anderson, Prairie du Sac, Wis.

Cardboard Inserted Under Hinge Corrects Binding Door Without Planing



Doors that drag on the threshold or bind at the top, in many cases, can be corrected by merely inserting a cardboard shim under one of the hinges. If the door binds at the bottom, remove the

lower hinge from the jamb, fit a piece of cardboard in the mortise and replace the hinge. The shim will lift the bottom of the door off the threshold. To correct a door that binds at the top, the upper hinge can be shimmed in the same way. Although a door that binds at the top can be planed easily, this stunt is particularly helpful when the door binds at the bottom, as it makes removal of the door unnecessary.

W. H. McClay, Pasadena, Calif.

Modern Picture Frame in Transparent Plastic Supported by Wire Stand

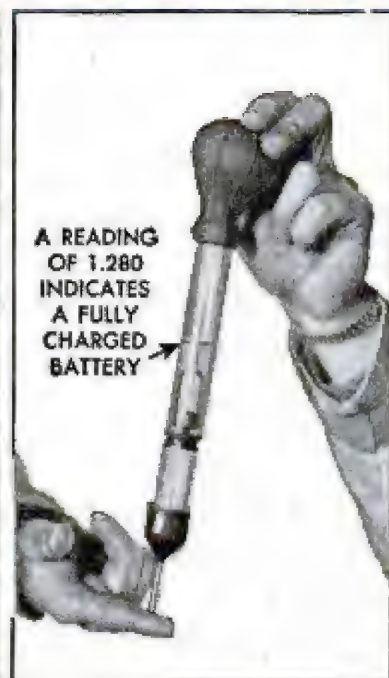
Combining clear plastic with a stand bent from $\frac{3}{16}$ -in. aluminum-alloy wire results in an attractive picture frame which can be made in a few minutes. Bend the wire to form the base of the stand and a double loop above it, joining the ends of the wire with cellulose tape. Then, cut the picture and cardboard backing to fit between the wire loops, and make the frame by cutting a thin sheet of clear plastic to slide over the front of the picture. The plastic not only frames the picture, but protects it and keeps it free from dust.

Frank Shore, New York City.

Keep a small bag in every room for a dustcloth. These bags may be secreted in hidden, yet easily accessible, places. This will save time and steps and assure a cloth being at hand for a last-minute dusting.



PERIODIC CHECKS



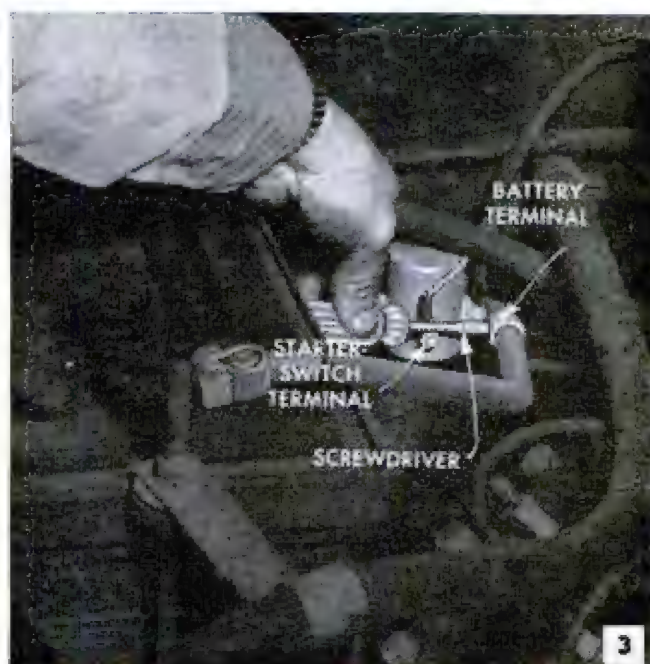
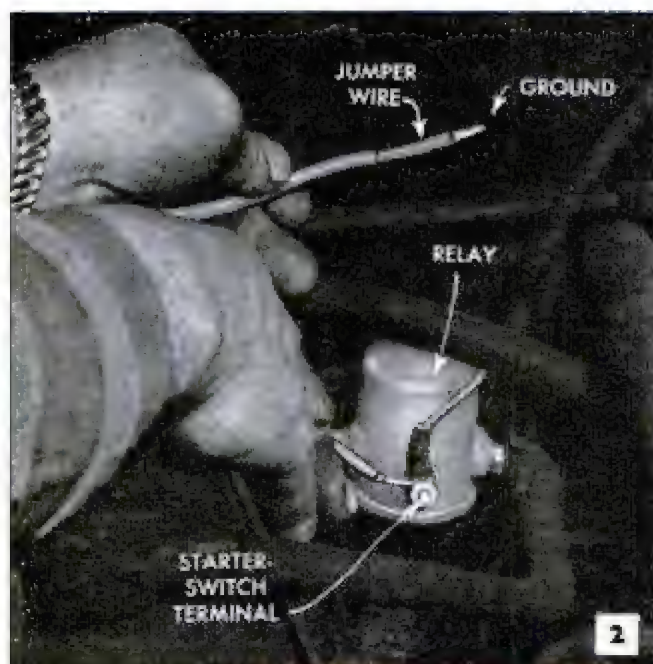
By Phil Ruskin

YOUR CAR will not stall on the highway or give trouble starting in cold weather if the starting and ignition systems are kept in top-notch condition by periodic inspection and repair. Most parts of both systems are inexpensive to repair or to replace entirely when no longer serviceable or reliable. As a rule, the battery will require periodic checks more frequently than other parts. During the hot summer months the liquid level should be checked at least once every 10 days to make sure that the level is kept above the plates in all three cells. Periodic checks with a hydrometer, Fig. 1, should show a reading of 1.280 or slightly higher. This not only indicates that the battery is fully charged, but that it is holding the charge without any appreciable loss over a period of time. Keep the battery and terminals clean and tight. On older cars it's a good idea to remove both the ground and starter leads and clean the terminals thoroughly. If the starter fails to turn the engine over steadily and strongly at any time, look for loose connections, worn or corroded leads and, of course, check the battery. Sometimes failure of the starter is due to a faulty switch, especially in later model cars having push-button starter switches on the dash. To check for a faulty switch, hold one end of a jumper wire on the relay terminal to which the lead from the switch is connected. Ground the other end of the wire to the frame or engine as in Fig. 2. The starter switch also can be checked as in Fig. 3, by simply placing the blade of a screwdriver across the switch and battery terminals. If

the starter motor turns over when either of these tests is made, the starter switch or its wiring is defective. If the starter motor does not operate, then the trouble may be in the relay or in the relay ground circuit. To check for a defective relay or relay circuit, have someone depress the starter switch and hold it in the "on" position. Hold a jumper from the ground terminal of the relay to the car frame, Fig. 4. If the starter motor turns over, the relay ground circuit is defective. If the motor remains inoperative when grounded in this way, the relay is defective and should be replaced.

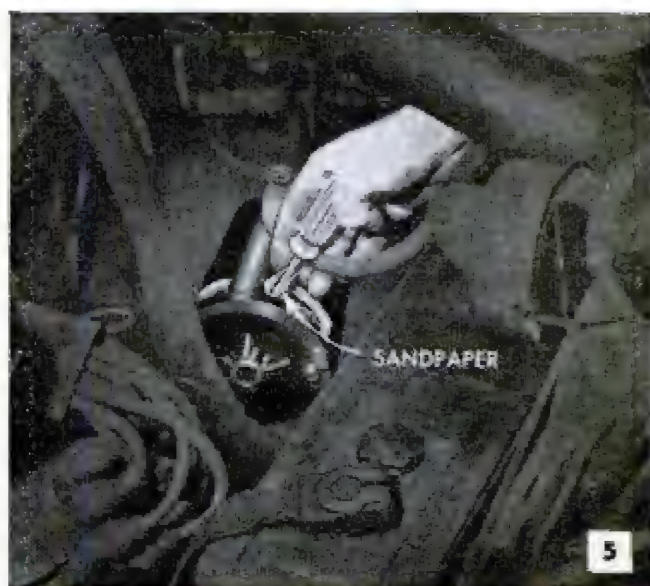
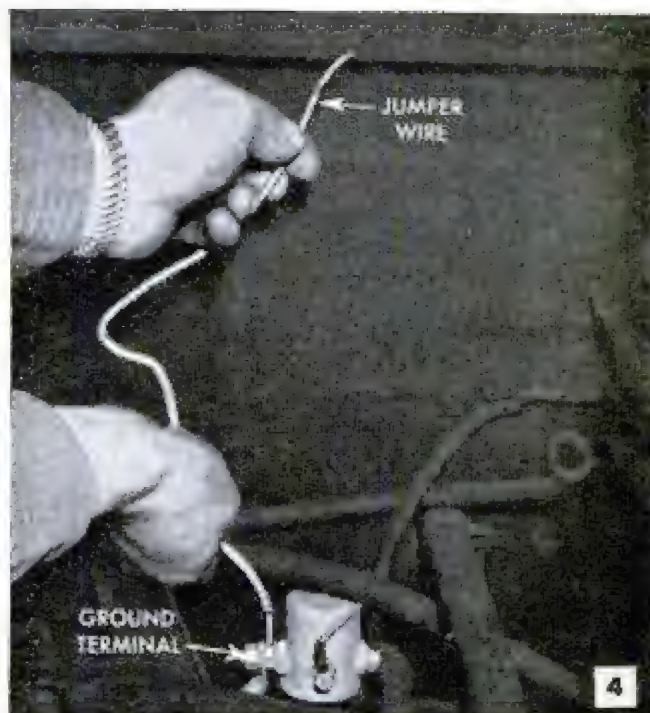
A periodic inspection of the starting circuit and the starter motor should be made every 5000 miles even though the system may be operating satisfactorily. This precaution is quite likely to catch certain defects while they are in the development stage, long before a failure occurs. One important step in this inspection is to remove the dust shield from the commutator end of the starter motor and check the condition of the brushes and commutator. If the commutator is in good condition, it is easily cleaned with fine sandpaper as in Fig. 5. Do not use emery cloth for this purpose, as some of the fine abrasive grains are certain to be loosened from the cloth in this operation and may find their way into the armature bearing. If, on the other hand, the commutator brush track is badly worn or grooved, then the armature should be removed and the commutator reconditioned or the starter motor replaced. Worn brushes should always be replaced. In checking the brushes, be sure that the follower springs bear on each one with a uniform tension, and that none of the brushes

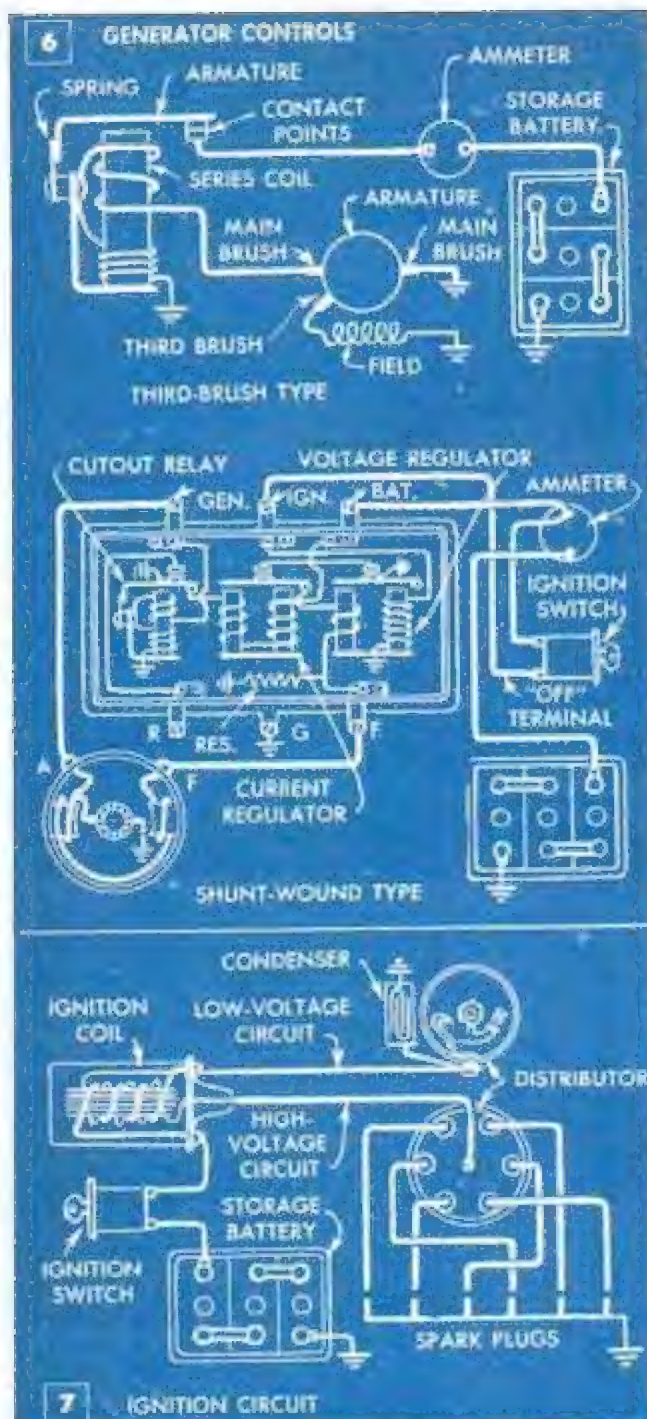
PREVENT IGNITION BREAKDOWN



is stuck in the holders. If the starter-motor bearings are fitted with oil cups, place a few drops of light oil in the cups at each inspection or after each 5000 miles.

The generator supplies current for ignition, lights, radio, heater and lighter at all engine speeds slightly above idling speed. It also supplies current for replenishing the battery. Fig. 6 shows wiring diagrams of the two types of generator controls in common use. In the third-brush type, the electrical output is controlled by shifting the third brush in the direction of armature rotation to increase output and in the opposite direction to decrease it. However, in some generators of this type the third brush is fixed, the output being controlled by a special regulator. A circuit breaker, or cutout, is provided with all common types of generators now in use to prevent discharge of the battery through the generator when generator voltage is lower than battery voltage, and also when the generator is not running. On the shunt-type generator, the output is automatically adjusted to the requirements of the electrical circuit at all times when the car is in operation. In this system there is no manual adjustment, as the automatic voltage regulator "meters" current to the battery, ignition system and accessories as needed. Trouble in the generator circuit is indicated when the battery either loses its charge rapidly or shows a constant condition of overcharge. A simple test for faulty charging is first to note the charging rate on the ammeter at a medium engine speed. Then shut off the engine and operate the starter for about 10 seconds continuously. Again start the engine and run at medium





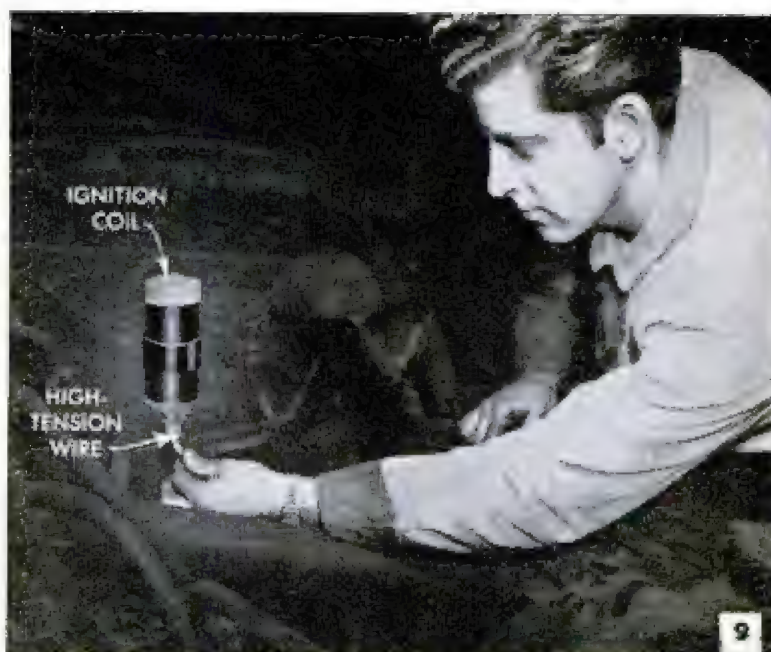
Checking the generator with a jumper wire. A bright hot spark indicates that the generator is charging

throttle. The ammeter should show a somewhat higher reading than before. After a few minutes of engine operation at the same throttle setting, the charging rate should taper off to about the same rate as first noted. If it does not, the voltage regulator probably needs adjusting. One thing to keep in mind in connection with this test is that high resistance in the charging circuit causes the regulator to operate as though the battery were fully charged. High resistance in the circuit can be caused by loose or corroded connections, worn generator brushes and frayed or damaged wiring. Generally it is a good idea to check for these defects before adjusting the regulator. If the ammeter shows discharge when all equipment and the ignition are off, it is likely that the cutout contacts are sticking in the closed position. If the ammeter shows no charge rate with the engine running at medium throttle, the cutout points are probably stuck in the open position. This trouble can be prevented by keeping the cutout contacts clean and adjusted to the manufacturer's specification. To check the generator itself for faulty operation, hold one end of a jumper wire on the field-wire terminal and, with the engine running, touch the other end of the wire to the ground, which may be the engine or the generator housing, Fig. 8. You should get a bright spark when the jumper makes and breaks contact with the ground. No spark indicates that the generator is not charging, and immediate repair or replacement is necessary. In servicing the generator periodically, follow the same procedure as in servicing the starter motor.

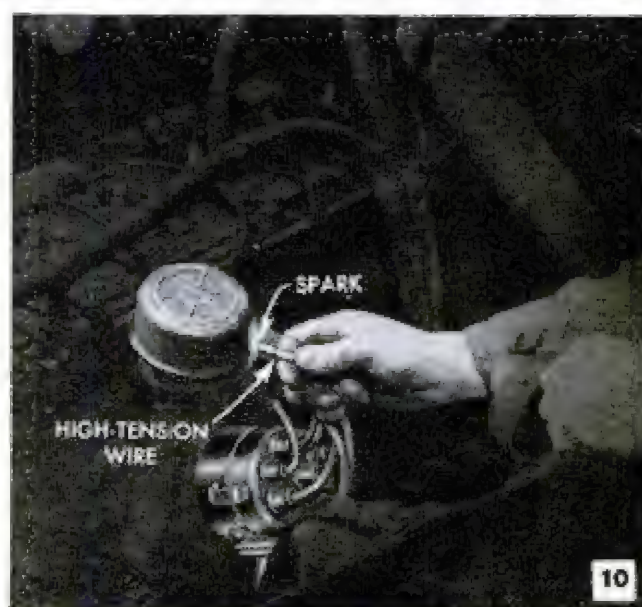
With the starter and generator circuits in good working order, any trouble with the ignition system, Fig. 7, usually is traceable to the distributor, coil, plugs or to the wiring that joins these units. A simple precautionary check is made by going over all the wiring, including that under the dash, at regular intervals. A slight twist on each rigid terminal will detect a faulty connection before it can cause trouble. Keep a careful check on the high-tension wire at the coil, Fig. 9. Often vibration alone will cause this wire to loosen sufficiently to break the ignition circuit. It will help in making even the simplest checks of the ignition system if one thinks of this as consisting of two separate electrical circuits, the primary (low voltage) and secondary (high voltage), Fig. 7. Primary current passes from the battery to the primary coil winding, then through the breaker points to the ground thus completing the circuit back to the battery, which also is grounded at one terminal. The secondary circuit originates in the secondary winding of the coil, from which it passes to the center

terminal of the distributor, then to the spark plugs and back to the ground. The high-voltage current is induced in the secondary winding of the coil when the breaker points open to interrupt the primary current. To check the coil, remove the secondary lead from the center of the distributor cap and hold it about $\frac{1}{4}$ in. from the cylinder block, or some other engine part as in Fig. 10. When the engine is turned over with the starter, you should get a bright, hot spark. If there is no spark, either the primary or secondary coil winding may be burned out. To determine which winding, remove the distributor cap and turn the ignition on. If primary current is flowing through the breaker points, it will show as a slight spark when the breaker points are opened with a screwdriver as in Fig. 11. This means that the primary winding is okay and that the secondary winding probably is burned out. Replace the defective coil. A weak spark from the secondary wire, using the above test, usually indicates a weak condenser. If the breaker points are pitted and burned, this proves it. In some cases, it will be necessary to replace both the condenser and breaker points. When replacing these parts, be sure that all connections are tight, and that the breaker points are adjusted to the recommended setting.

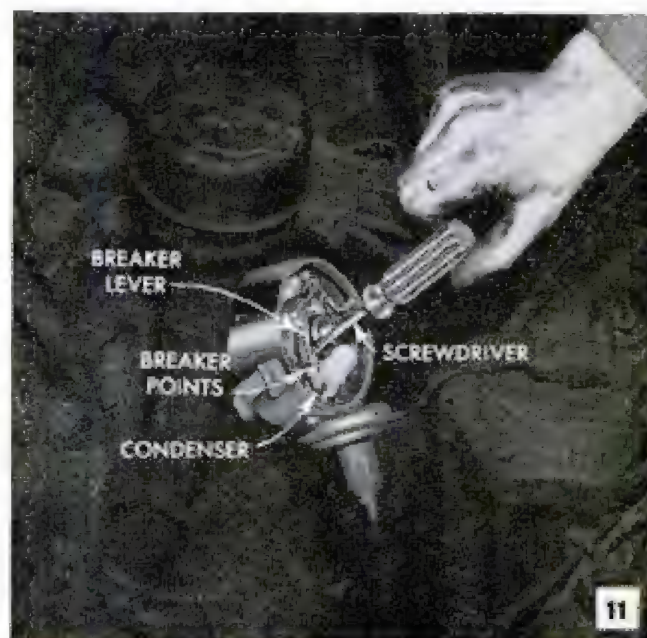
Any condition that builds up undue resistance in the path of the secondary circuit will result in a weak and irregular spark at the plugs. Carbon and oil or grease deposits in the distributor cap, loose connections at the plugs or in the distributor cap, frayed or broken insulation on the high-tension leads and a cracked rotor are causes of hard starting, sluggish pickup and high fuel consumption. If there are indications of burning and arcing in the distributor cap, replace both the cap and the rotor. If the high-tension wires to the plugs are worn, oil soaked, or have frayed or cracked insulation, it will pay to replace these also. Make it a rule to examine the rotor each time the distributor cap is removed. Be sure that it seats properly on the shaft and that it makes good contact with the secondary lead and the spark-plug lead inserts. Any time the ignition system is serviced, remove and clean the spark plugs and check the electrode gap on each plug. It is important to set the spark-plug gap to the exact specification of the manufacturer of the car. It will be worth-while to install new spark plugs at the end of each 10,000 miles of service.



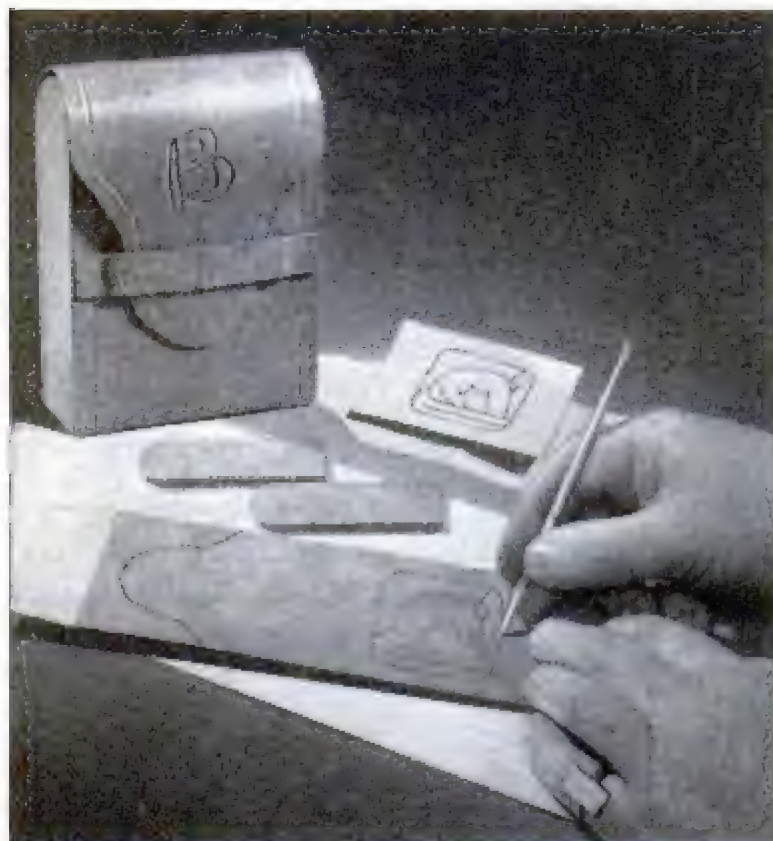
Keep a regular check on the high-tension lead at the coil



Above, a simple check will show up a faulty coil. Below, if primary current is flowing from the coil, a spark will show when the breaker points are opened



Cigarette Case in Laminated Paper Is Tooled to Simulate Fine Leather



By laminating paper with resin-type glue, it is easy to make an attractive cigarette case that simulates tooled leather. First, form the sides of the case by gluing together two thicknesses of heavy cardboard. Make the front, bottom, back and cover of the case in one piece, using sheets of medium-weight paper laminated with glue. Then cover the inside of each of the parts with colored paper and the outside with leather-textured cover stock. When mounting the latter, apply the glue liberally so it will penetrate the paper and permit tooling. Trace the design and, before the glue dries, tool with an orangewood manicure stick. Lubricate the point with paraffin, and apply the stick with sufficient pressure to tool the paper deeply. Bend the bottom and cover to shape before the glue sets and glue the three parts together. Glue a strip of laminated paper across the front of the case to serve as a hold-down for the cover.

Wooden Drill Jig Facilitates Locating Centers of Dowels and Round Stock

Centers of dowels and round stock are located and marked in one operation with the aid of this wooden drill jig. The latter is a 2½-in. hardwood cylinder about 3 or 4 in. long. This is drilled exactly through the center with a ¼ to ½-in. bit and tapered inward 45 deg. from the edges to the center hole. In use, the jig is slipped over a bit of

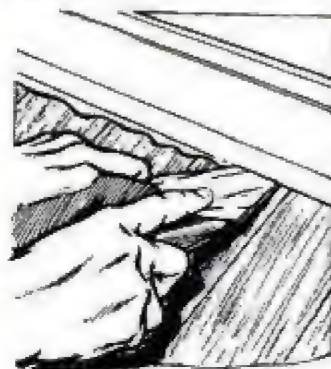
the same diameter as the center hole, upper photo, so the end of the bit is inside the hole. Then, the work is pressed firmly into the jig and against the rotating bit, as in the lower photo. The angular sides of the jig guide the work so the bit can mark the exact center. Be sure to oil the hole in the center of the jig to prevent the bit from cutting into the wood and enlarging the hole. This method can be used either on a drill press or a lathe with a drill-chuck attachment.

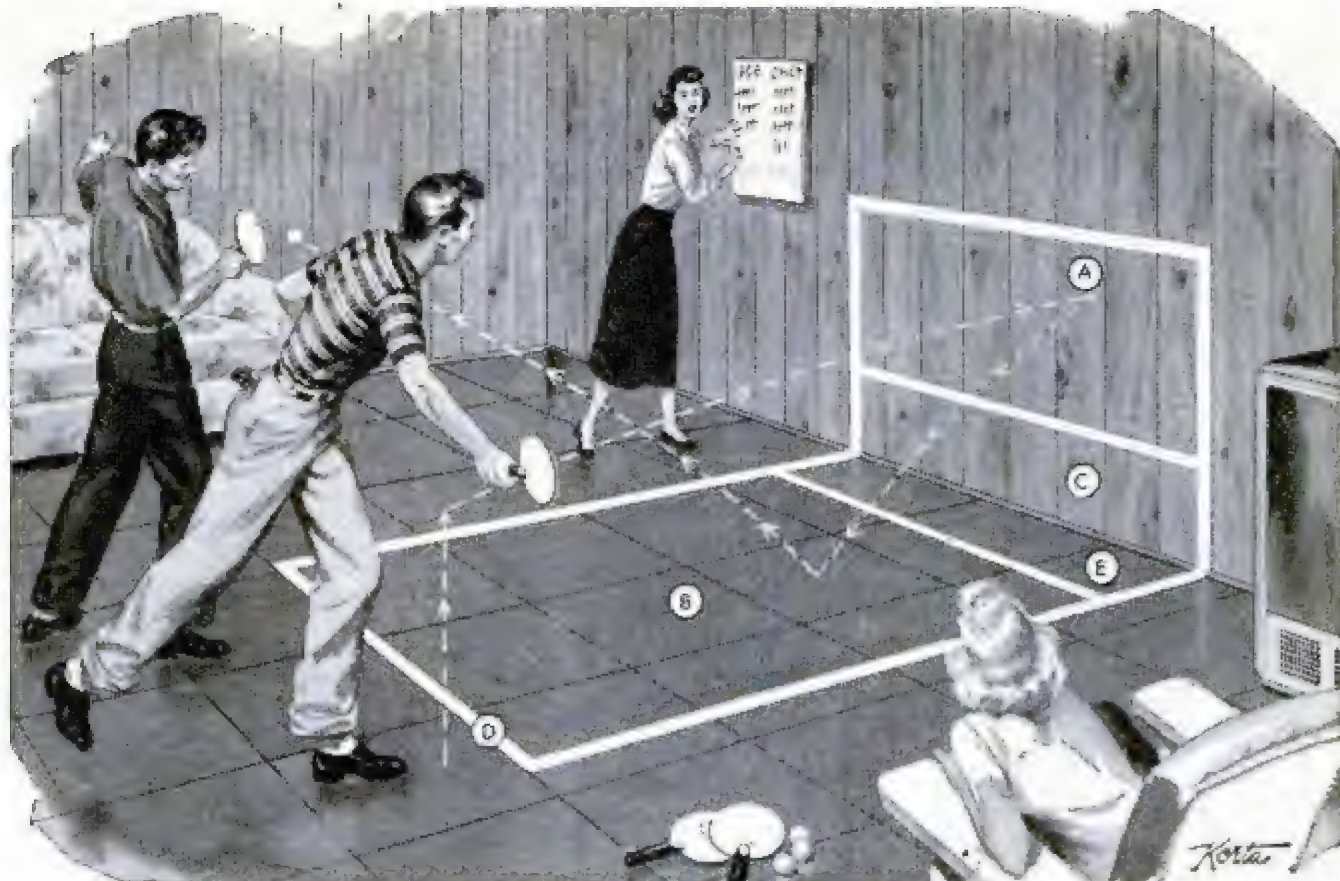
W. G. Waggoner, Sacramento, Calif.



Cloth Placed Over Putty Knife Removes Excess Paint

When painting woodwork, excess paint is bound to flow from the quarter round onto the varnished floor or from the trim to the wall. This can be wiped off quickly without smearing the newly painted surface by using a single thickness of cloth wrapped around the blade of a putty knife. The cloth is rubbed lightly over the wet paint to absorb and erase it.



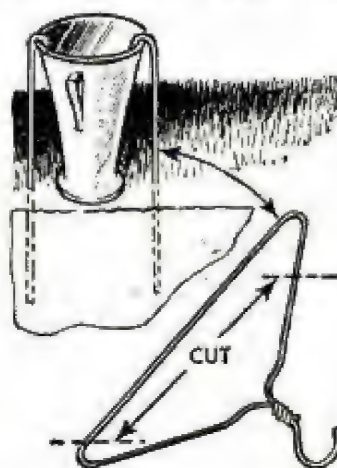


"21" Game Combines Squash and Table Tennis

If you like plenty of fast action in the rumpus room, then here's your game. It's similar to table tennis, the scoring being the same, and is played with the same type of balls and paddles. The court boundaries are lines painted on the floor and wall of the room, or strips of masking tape can be used for this purpose. The lines enclose two courts on the floor and two on the wall as shown. The over-all floor space required is 5 ft. wide and 10 ft. long and the wall space is 4 ft. high and 5 ft. wide. Spaces C and E are each 16 in. wide and 5 ft. long. Spaces A and B are called the wall court and the floor court respectively. If desired, the wall and floor courts can be made larger. In starting the play, the first player serves the ball by bouncing it on the floor behind the base line D. On the first bounce, the ball is batted against the wall court A, from which it must bounce back into court B to remain in play. As the ball rebounds from court B, the second player hits it back against court A, thus putting the ball in play alternately between the players. Points are scored by a player when his opponent faults, or fails to return the ball. Each player serves for five points alternately, and the winner is the first player scoring 21 points. Should the game be tied at 20-all, the winner must take two consecutive points, as in table tennis. Faults are: bouncing the ball on serve inside the base line D, ball hitting the wall outside of

court A, ball bouncing back onto the floor outside of court B. If the ball strikes within spaces C or E in the course of play, this also is counted a fault. A player must move quickly out of the way after making a shot, as it is counted as a fault if the ball strikes his body on the rebound, thus preventing his opponent from returning it. Except on the serve, players may step within the boundaries of court B whenever necessary. The rules given are merely suggested ones which can be varied to suit conditions.

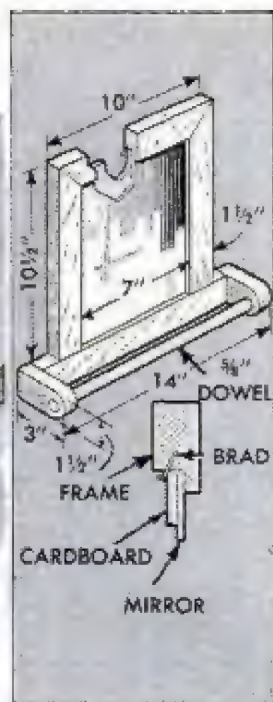
anchors for Cemetery Vases Cut From Coat Hangers



Pottery vases and jars which are used to hold cut flowers on a grave are likely to be blown over by the wind unless they are anchored. Excellent anchors can be cut from wire coat hangers as shown in the detail. Make two of these for each vase and press them firmly into the ground with their hooked ends engaging the rim of the vase.

Mrs. Michael Fey, New York City.

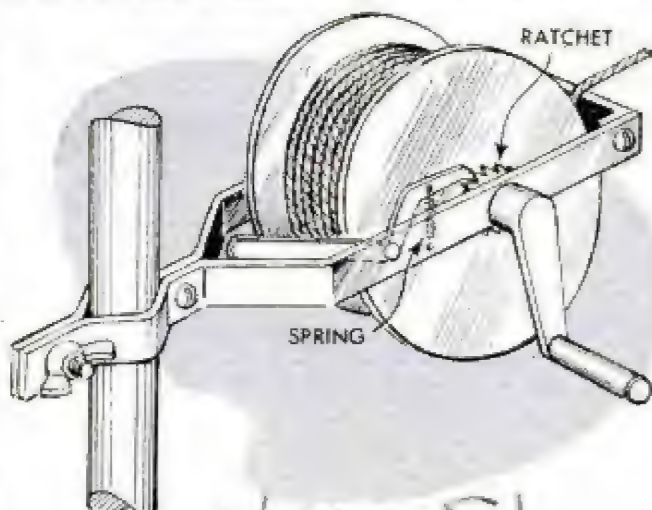
Child-Size Mirror and Towel Rack in Bathroom Encourages Habits of Personal Cleanliness



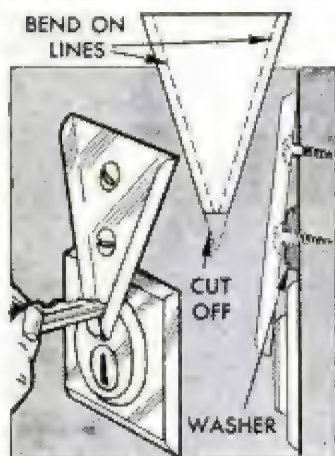
With a special bathroom mirror all her own—just like the big one over the washstand—your child won't have to be coaxed to brush her teeth or comb her hair. This miniature mirror-and-towel-rack combination is hung from the bathroom wall at a convenient height for the child. The mirror frame and rack are made from 1 x 2 and the towel bar is a length of $\frac{5}{8}$ -in. dowel. The frame is rabbeted to receive the mirror in picture-frame fashion. After the parts are glued together, the wood can be painted a color that harmonizes with the bathroom finish.

Self-Locking Garden Reel Mounted on Flat-Iron Frame Aids Row Marking

When it comes to planting straight rows, laying out neat flower borders and grading or filling-in the garden, this self-locking reel is a useful item to have at hand. The spool and shaft are mounted in a flat-iron frame which is clamped to a length of iron rod by means of a wing nut. The rod is driven into the ground to serve as an anchor. A spring-action pawl engages a ratchet on the reel shaft to hold the line taut.—W. H. Eyerly, South Norwalk, Conn.



Metal Funnel Locates Keyhole



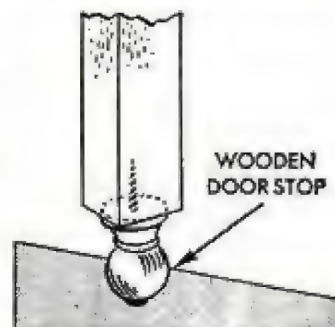
If it is difficult to locate the keyhole to your apartment in a darkened hallway, fasten a sheet-metal "funnel" above the lock to serve as a guide for the key. After cutting the metal to the shape of a triangle, bend the edges at right angles to form the sides of the funnel.

Then, screw it to the door, positioning it so that when the end of a key is slid downward against the metal, the sides of the funnel will guide it into the keyhole. If the lock protrudes from the door, place a washer over the lower screw to support the center section of the funnel.

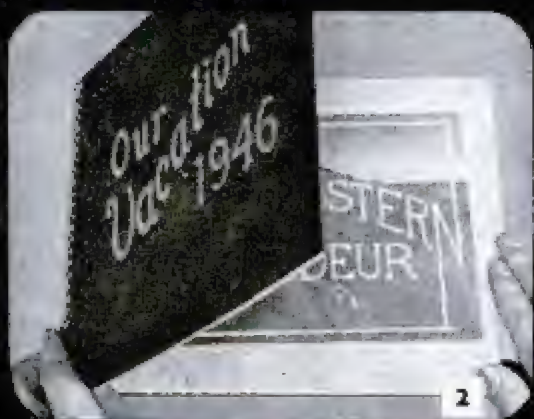
N. V. Davidson, San Diego, Calif.

Doorstops Raise Youngster's Table

A child's table which has been outgrown will still serve as a useful play table if a couple of inches are added to its height. This can be done by attaching a wooden doorstop to the bottom of each leg. Thus, besides increasing the height, the stops, which are screwed in place, look like a turned part of the leg.



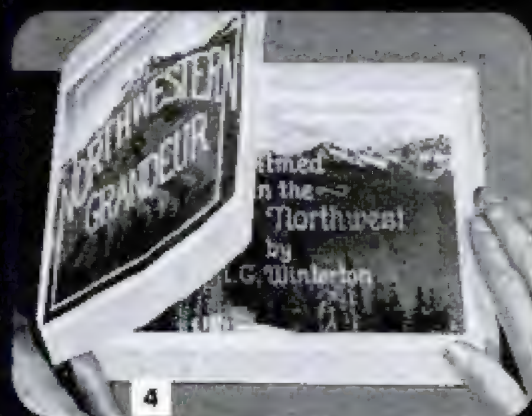
☛ To remove burs from a dog's hair, work gun oil into the tangle with your fingers and the burs can be removed easily.



MOVIE TITLES *from your* VACATION ALBUM

By M. G. Winterton

THAT PHOTO album made up of choice shots taken on your vacation trip can be utilized effectively for titling vacation movie film. By carefully arranging a sequence and introducing eye-directing motion, it is easy to maintain an interesting continuity throughout the entire film. Figs. 1 to 4 inclusive suggest an opening sequence. The first, Fig. 1, introduces the album, the hand reaching for it lending just the proper amount of animation to catch and hold the interest of your audience. The next frame, Fig. 2, shows the hand turning the cover of the album in a natural manner and gives a hint of the locale where the scenes to follow were filmed. The third frame, Fig. 3, fixes the attention of the audience, titles the picture story and indicates the location. Then the page is turned, revealing the first subtitle. If you wish, other introductory shots, perhaps of the camera man, can be worked into the sequence. If your vacation movies are in color, colored postcards or publicity pictures make fine title and subtitle backgrounds over which the title can be lettered. Gummed paper letters, available at most all stationery stores, can be arranged over a colored title background





as in Figs. 6 and 8. These can be tinted to contrast pleasingly with the background by using ordinary water colors. The introductory scene also can include the special features shown in Figs. 5 and 7. In Fig. 5 the first subtitle is followed by a map on which you have lettered arrows and names to point out the places of special interest which were visited on the trip. This is followed by a shot of the calendar month in

which the trip was taken. On this you bracket the number of days on the road, the places of interest visited and the time on the road between stops. The suggestions for subtitles in Figs. 6 and 8 are especially appropriate in introducing special features of the film. After the album has been filmed, the vacation movie is edited and the title and subtitle frames are stripped-in in the regular manner.

Radiator Holds Ferrotypes Tins to Serve as Improved Print Drier



radiator while drying. This counteracts the natural curl of the prints. For matte-finish prints, place the emulsion side of the

Curving ferrotypes so their ends fit between the sections of a room radiator produces a convenient and efficient print drier. Apply glossy prints to the ferrotypes tins emulsion side downward and curve the tins so the prints face the

paper upward and reverse the curve of the tins so the prints face the room. Cover the matte prints with cheesecloth or porous toweling for more even drying and to keep them from falling off the tins.

Pat Richardson, Minneapolis, Minn.

Emergency Ground Glass

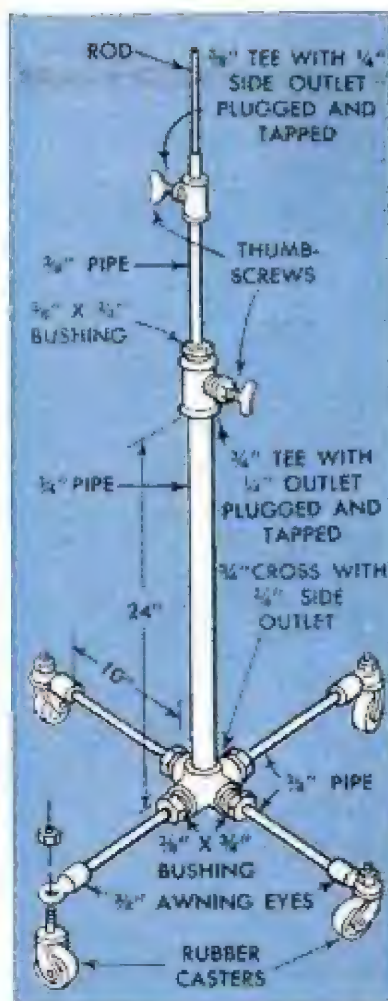
If the ground glass on a camera is broken and there is not time to obtain a new one, the Cellophane wrapping from a cigarette package will serve as a substitute. Cut the Cellophane to fit the ground-glass frame and dull one side with sandpaper or by rubbing it over a concrete surface.

Anthony Cararie, Lawton, Okla.

Made primarily of pipe fittings, this sturdy photo-light stand, which is mounted on casters, can be moved into position easily and is quickly taken apart for carrying. The base of the stand consists of a $\frac{3}{4}$ -in. cross with $\frac{3}{4}$ -in. side outlets, four reducing bushings, four lengths of $\frac{3}{8}$ -in. pipe and four awning eyes which are turned on the ends of the pipe. The casters are bolted to the awning eyes. If a $\frac{3}{8}$ -in. cross with a $\frac{3}{4}$ -in. side outlet is available, the reducing bushings will not be necessary. The lower section of the stand is a length of $\frac{3}{4}$ -in. pipe, and a tee, having a $\frac{1}{4}$ -in. outlet, is turned on the end of the pipe. The outlet is plugged and then drilled and tapped for a thumbscrew. A $\frac{3}{8} \times \frac{3}{4}$ -in. reducing bushing is turned into the end of the tee. The $\frac{3}{8}$ -in. threads are reamed out to permit the next section, which is a length of $\frac{3}{8}$ -in. pipe,

to slide through. A second tee, also fitted with a thumbscrew, is mounted on the end of the $\frac{3}{8}$ -in. pipe. However, a short length of $\frac{3}{8}$ -in. pipe instead of a reducing bushing is turned into the top end of this tee. Then

Adjustable Photo-Light Stand of Pipe Fittings Rolls on Casters and Is Disassembled Easily



a length of $\frac{3}{8}$ or $\frac{7}{16}$ -in. cold-rolled rod is inserted in the pipe and clamped with the thumbscrew. The lights are mounted on the end of the rod in the usual way.

Norman Fallon, Sedona, Ariz.



Hardboard Easel for Enlarger Permits Contact Printing

By utilizing light from an enlarger, contact prints from several negatives of cut or strip film can be made simultaneously with this hardboard easel. The easel is assembled in a few minutes and the only expense is that of a sheet of hardboard and a piece of plate glass. To permit aligning the paper and negatives, two wooden cleats are tacked at right angles to each other on the smooth side of the hardboard. The glass, which holds the negatives flat against the paper, covers the entire surface of the easel from the inside edges of the cleats to the edges of the board. The latter is notched at one side to aid lifting the glass with the fingers and the edges of the glass are covered with masking tape. The size of the easel depends upon the area covered by the light from the enlarger.

Ande Photography Studio, Chicago.



Cellulose Tape Masks Paper For Multiple Printing

When two or more pictures are printed on one sheet of photo paper, an even white margin between the prints is insured by masking the margins with colored cellulose tape. To prevent fogging, be sure to cover the areas not being printed during each exposure. Do not press the tape in place too firmly or it may mar the emulsion when pulled off. Remember to remove the tape before developing the print.

Virginia Hanson, Santa Monica, Calif.

Cardboard Clamped to Reflector Shields Lens From Direct Light

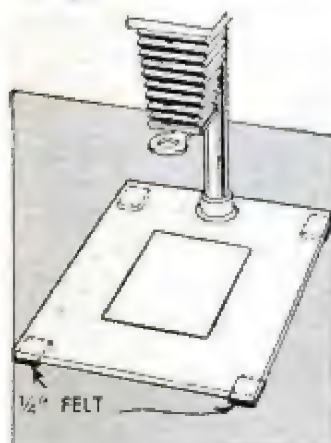


When a clamp-on reflector having a light-stand adapter is mounted on a stand, the unused clamp makes an excellent holder for a cardboard shield. As the clamp is attached with a

swivel joint, the cardboard can be moved to any position to shield the camera lens.

Arthur Trauffer, Council Bluffs, Iowa.

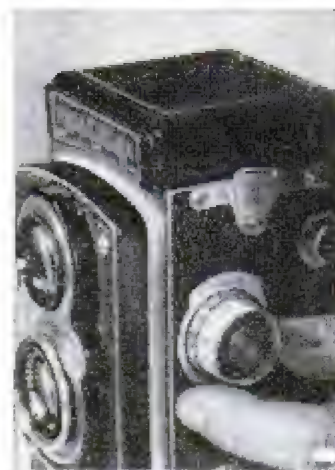
Enlarger Vibration Reduced By Felt Pads Under Base



To reduce enlarger vibration to a minimum, cement a felt pad, approximately $\frac{1}{4}$ in. thick, to the underside of the base at each corner. In addition to absorbing vibration, the pads provide a stable base. — Henry Zave, Chicago.

Scale on Camera Focusing Knob Indicates Flash Exposure

If your camera is a reflex type having a focusing knob which makes only one complete turn, you can equip it with a scale that will indicate automatically the correct aperture setting for the distance focused when taking a flash shot. To make the scale,



wrap a strip of paper around the focusing knob and, while holding it there, calibrate it by marking the various distances on it. Then type corresponding shutter settings for flash shots at $\frac{1}{100}$ sec. on the paper and fasten it to the knob with cellulose tape. With both the speed and distance marked on the scale, the correct aperture for the distance focused is indicated automatically by merely turning the knob. The same film speed and the same size flash bulb must be used each time to obtain consistent results.—Kenneth Murray, Colon, Mich.

Cotton Serves as Tissue To Clean Lenses

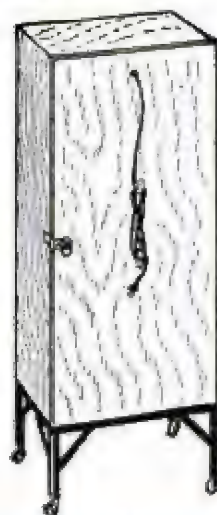
Surgical cotton forms an excellent substitute for lens-cleaning tissue. It is lintless and so soft it cannot damage the lens. Fresh cotton should be used each time and then discarded, as dust on the cotton is liable to scratch the lens surface. When not in use, the package of cotton should be kept tightly closed for the same reason.



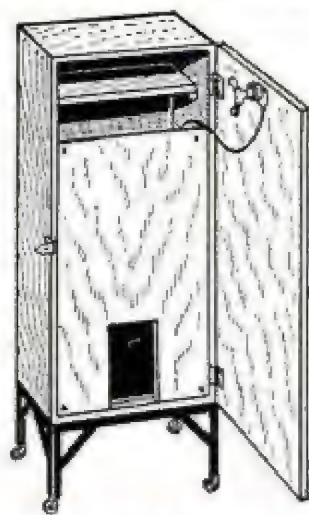
APARTMENT PHOTO LAB

By W. C. Horst

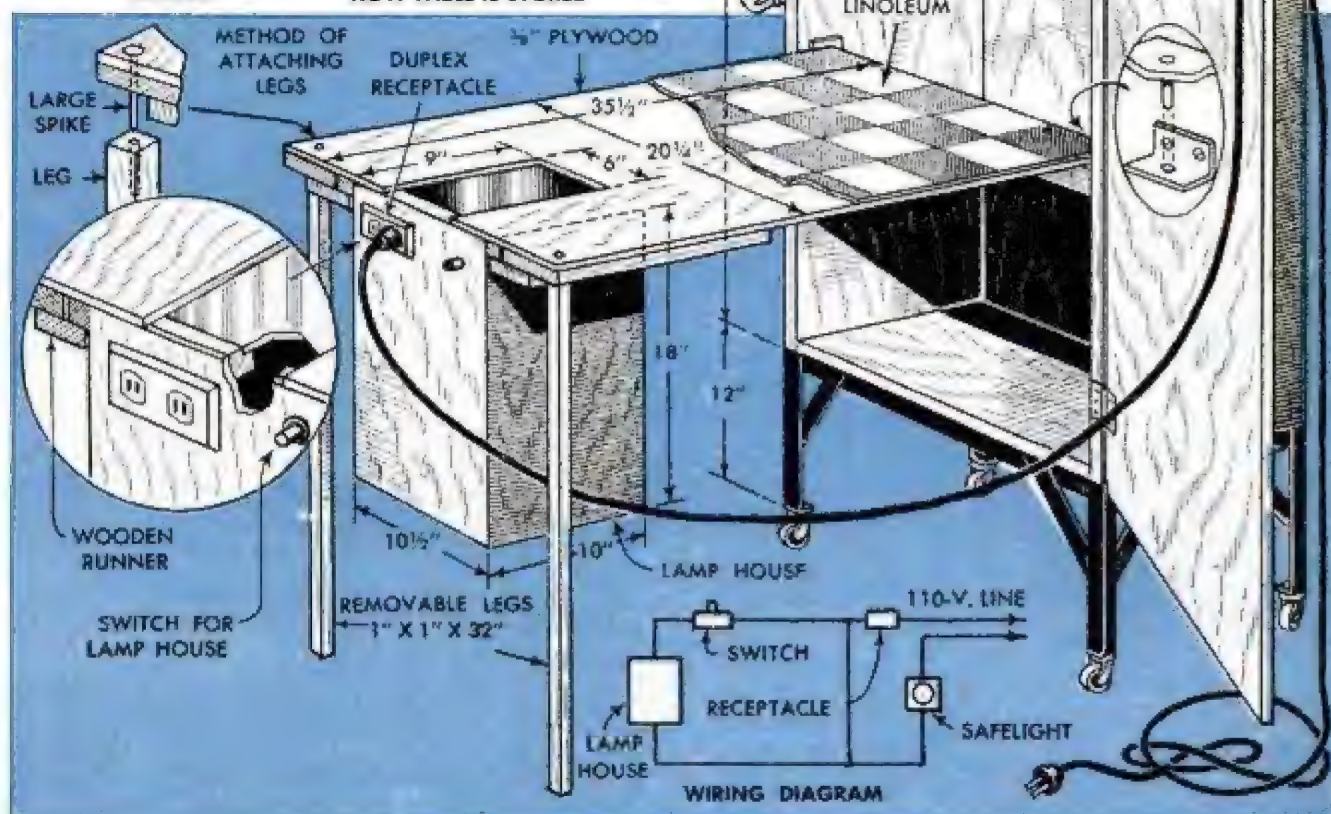
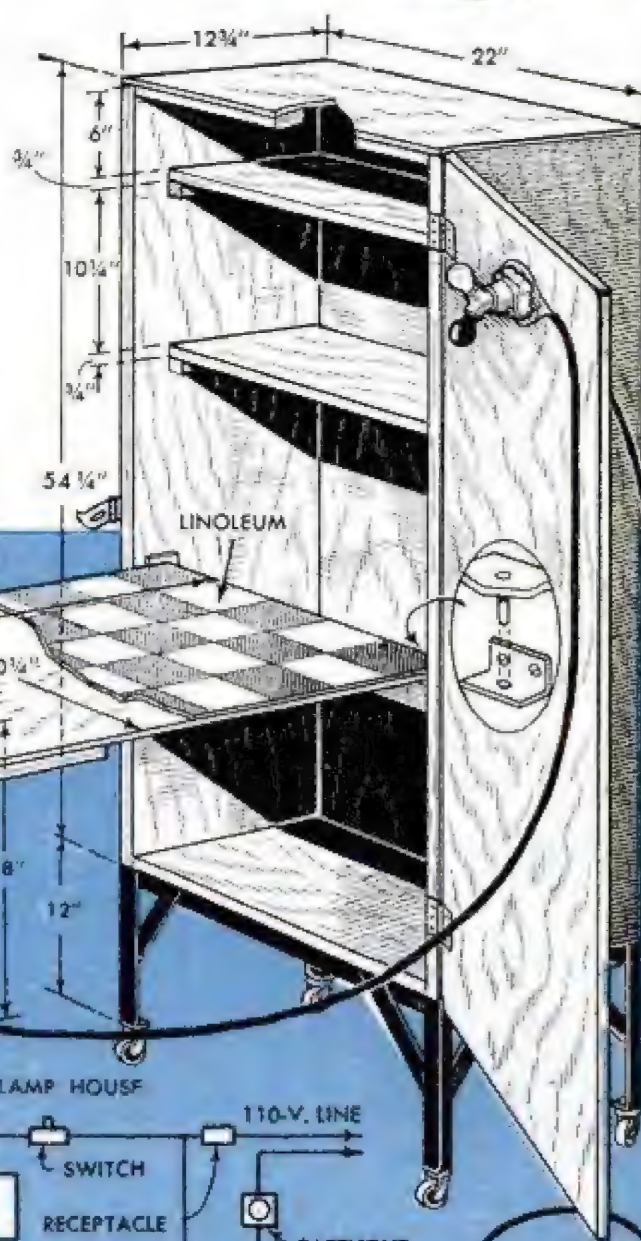
Occupying only 2 sq. ft. of floor space, this compact photo lab is the answer to the problems of the amateur photographer who lives in a small apartment. It consists of a roll-away cabinet mounted on an angle-iron base, a knock-down table, a contact printer, and a safelight. The printer and the table legs are stored in the bottom of the cabinet with the table set upright in front of them. Shelves in the upper part of the cabinet provide room for paper, chemicals, etc. The construction combines solid stock and plywood and the table top is covered with linoleum. Pins and brackets are used to hold the table in the open position and the removable legs are held with long pins. The printer is controlled independently from the safelight which remains on when the unit is plugged into the line as shown in wiring diagram



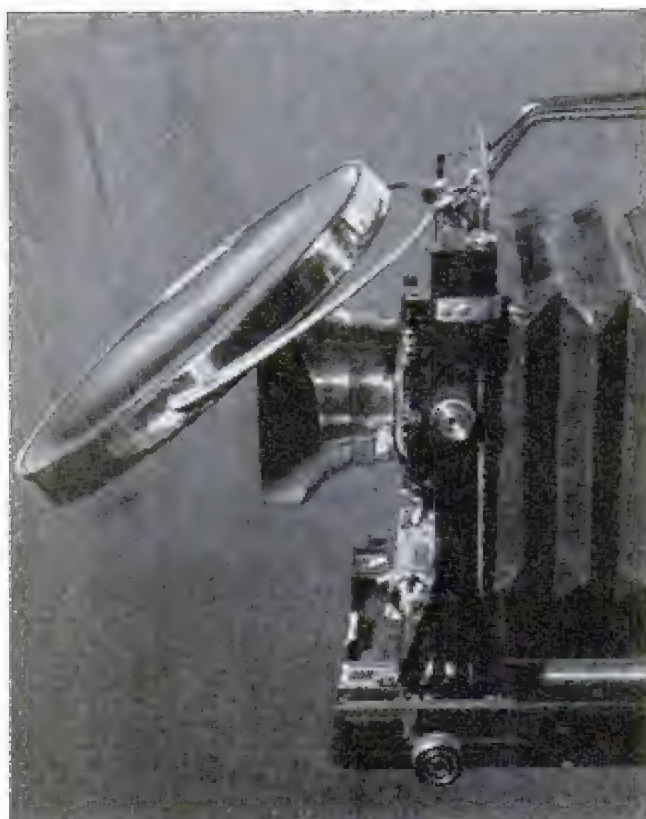
CLOSED



HOW TABLE IS STORED



Camera Fitted With Hand Mirror Used for Direct Copying



Direct copies of photo releases and other legal documents can be made with any camera that will handle cut film. Just load fast enlarging paper into the film holder, mount a hand mirror on the front of the camera, as shown, and take the photo. The camera is set up horizontally with the lens directly above the material to be copied. The mirror, which is positioned to reflect the image into the camera lens, makes the copy read properly instead of in reverse as it would in a negative. The correct exposure can be determined in a short time by trial and error and the paper is developed in the same way as an ordinary print.

Sensitive Switch on Contact Printer Operates Light Automatically



If you use a homemade contact printer or one without an automatic switch, the light can be operated by mounting a sensitive switch directly under the handle of the printer. Use

a switch that is normally in the open position so that pressure from the handle when the cover is closed will turn on the light, and release of the pressure by opening the cover will turn off the light. A wooden

block or a flat-headed screw driven in the underside of the handle will depress the switch button. With a little experimenting, the switch can be adjusted to turn on the light only when the printer is closed.

U.I. '51 Plastic Bag Protects Camera

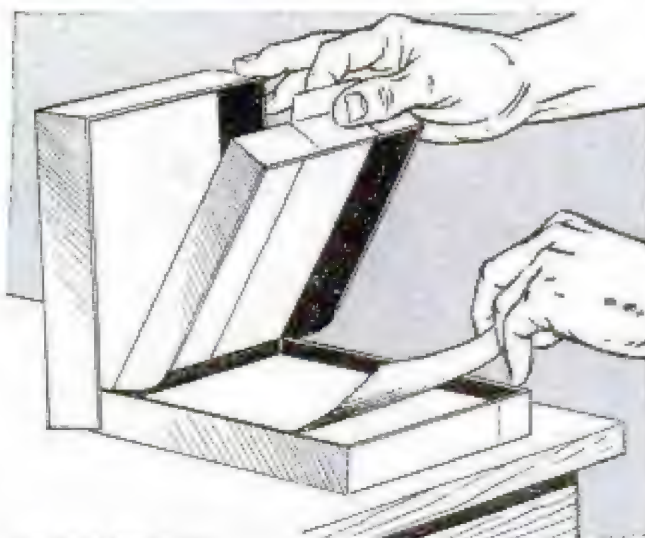
When taking a camera on a vacation where it is likely to be damaged by sand or moisture, protect the mechanism by placing the camera in a plastic food bag. Use the type of bag which is fitted with a drawstring closure. When not in use, the bag can be carried in your pocket.



Photo-Paper Box Made Lightproof By Adding Second Cover

To keep photo paper conveniently at hand in the darkroom, one photographer unwraps the paper and stores it in a special box fitted with an extra cover. This cover, which makes the box lightproof, is made from the bottom of a spare box. After one end is cut away, as shown by the dotted lines, the box bottom is cut in half, $\frac{1}{8}$ in. being removed from the center. The two parts are taped together to form the second cover, their sides fitting in the space ordinarily taken up by the wrapping. Rounding the sides at the back and adding a tab at the front aid opening the box. A suitable tab can be formed by sticking a strip of paper tape to the front and top of the cover.

Michael Ligocki, Gary, Ind.



REMOVE $\frac{1}{8}$ " FROM
CENTER OF BOTTOM



POPULAR MECHANICS

HI-POWER ATTACHMENT FOR BINOCULARS

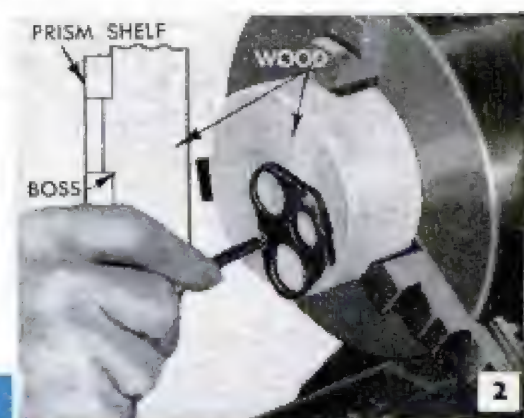
IF MORE power is desired from those 6X Army or 7X Navy binoculars, you can convert them to 8, 10 or 11 power, or even more, simply by adding a negative lens to each optical system. These lenses are inexpensive and can be obtained from war-surplus dealers specializing in optical equipment. The performance of the altered glasses is excellent, the only fault being an increase in the field curvature which causes objects at the edge of the field to be less sharp than those at the center of the field.

The general arrangement of the optical system, which is shown in the full-size detail, Fig. 5, is that of a modified telephoto lens. A negative lens combined with the positive objective serves to increase the equivalent focal length of the objective without greatly affecting its forward position. The internal shoulder of the objective-lens cell should be run out on the lathe to permit maximum forward position of the objective, and it will be necessary to add a $\frac{3}{32}$ -in. spacer below the objective adapter. This size of spacer is for the 6X-to-8X conversion only, other sizes being given in the table, Fig. 3. The negative lens itself is fitted in a cell which is screwed into the prism shelf, Fig. 1. Threads for the cell are already cut in the left-hand prism shelf (these were originally intended for a reticle cell), but the right-hand cell is blank and must be threaded to suit. This job is done easily by screwing the shelf to a wooden block which is chucked in the lathe. This block has a guide boss turned at the center as shown in Fig. 2.

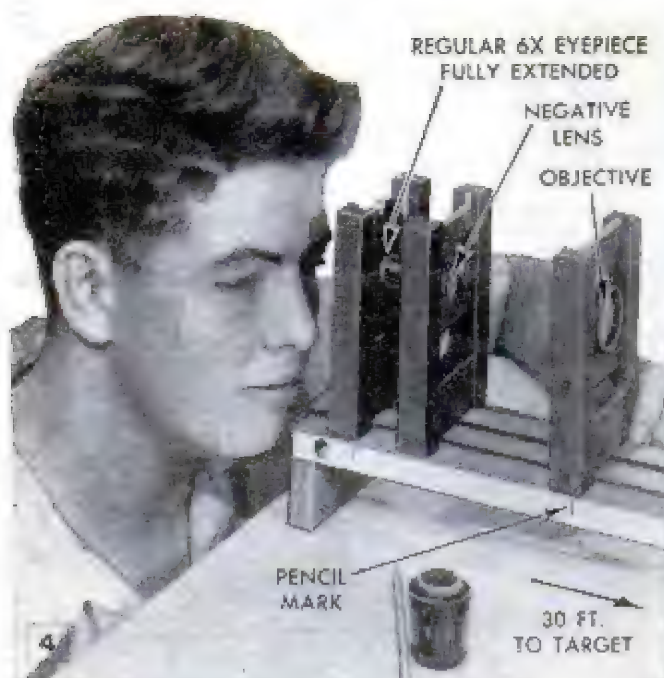
Note in the table, Fig. 3, that the stronger the negative lens (short focal length) or the shorter the spacing from prism to lens, the higher the power of the binocular will be. Therefore, it is important to keep both sides of the binocular at exactly the same spacing. An easy check of the magnification of each



Above, assembly of negative-lens parts. Right-hand prism shelf must be threaded

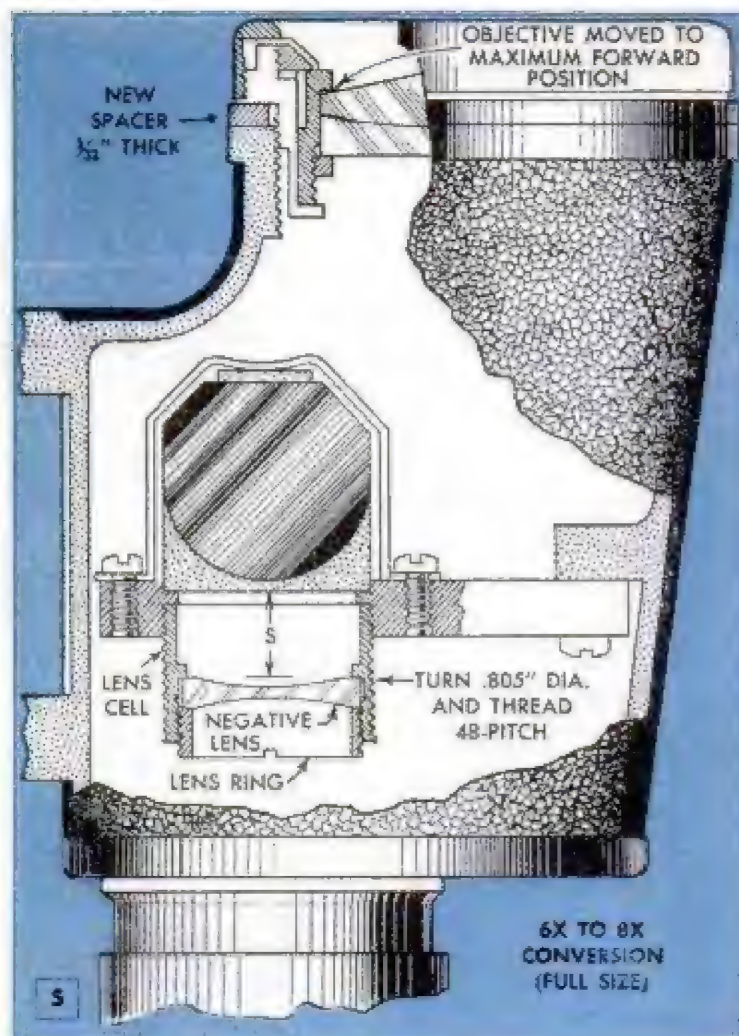


3 CONVERSION DATA													
	Power	Negative Lens	Space "S"	Field	Objective Advance	Percent Light		Power	Negative Lens	Space "S"	Field	Objective Advance	Percent Light
USING ARMY 6X BINOCULAR	6X	—	—	150 yds.	—	100	USING NAVY 7X BINOCULAR	7X	—	—	125 yds.	—	200
	8X*	17.5 x 52	$\frac{3}{16}$ "	90 yds.	$\frac{1}{16}$ "	56		8X	23 x 152	0"	90 yds.	$\frac{3}{16}$ "	156
	10X	19 x 36	$\frac{1}{4}$ "	70 yds.	$\frac{1}{8}$ "	36		10X	25 x 48	$\frac{1}{4}$ "	70 yds.	$\frac{1}{8}$ "	100
	11X	19 x 28	0"	62 yds.	$\frac{3}{16}$ "	30		11X	25 x 48	0"	62 yds.	$\frac{1}{4}$ "	83



optical system is made by swinging the binocular housings outward. Then, viewing a sheet of paper at about 30 ft. away, you will see two images of the paper and can note which one is the larger. Adjust by unscrewing the negative-lens cell on the strong side of the binocular until a balance is reached. Check the amount of turn-out necessary and transfer this to the weak side by turning off the same amount from the end of the weak-side cell.

Various powers can be tested on the optical bench, Fig. 4, using a target at 30 ft. and with the eyepiece fully extended. Use the objective and eyepiece only and mark the bench to show the normal location of the objective. Then, add the negative lens without disturbing the eyepiece.



Gradually move the negative lens forward and readjust to sharp focus by moving the objective. In this way, you can see the magnification increase and the amount of extension needed. For extensions over $\frac{1}{8}$ in., it is necessary to make a front extension for the objective.

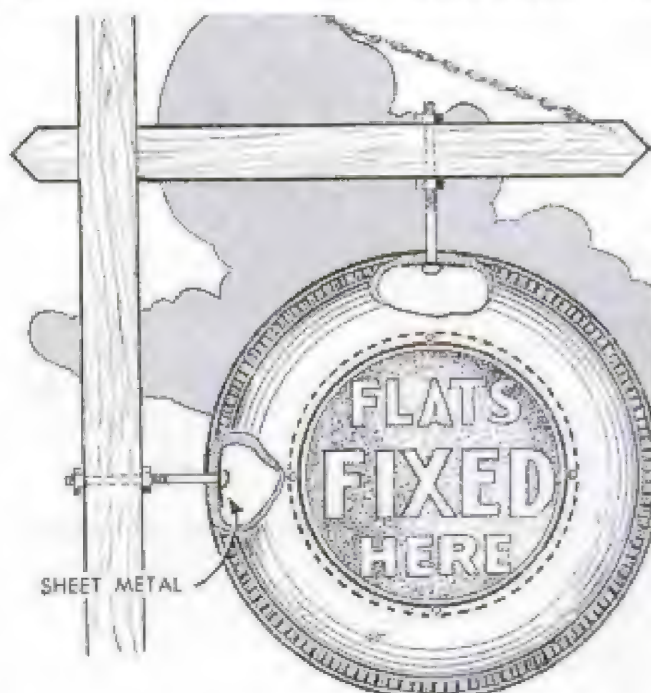
Display Sign for Garage or Filling Station Made From Old Auto Tire

An old auto tire suspended from a post provides a novel frame for a garage or filling-station display sign. The tire is attached to an upright and a horizontal member with long bolts, the heads of which are reinforced with sheet metal. A sheet-metal sign, slightly larger than the diameter of the tire rim, is held in place with bolts. The tire can be painted black.

Shading With Yellow Pencil Produces Neater Tracings

When it is necessary to indicate solid areas on tracings, such as carbide-tipped tools or shaded details, one draftsman uses a yellow pencil instead of a black one. He finds that the yellow-shaded areas stand out more sharply than the black and that the yellow does not smear or rub off.

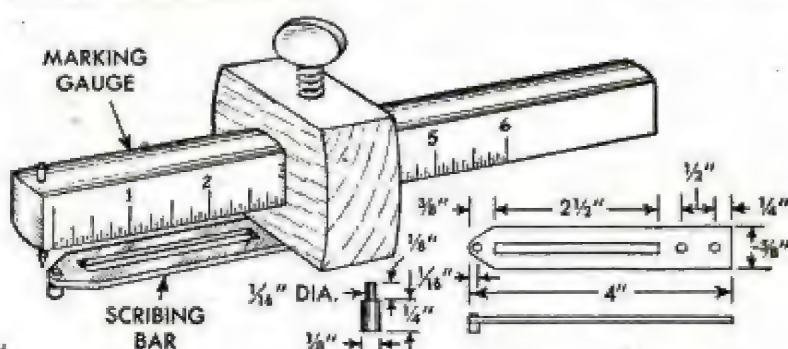
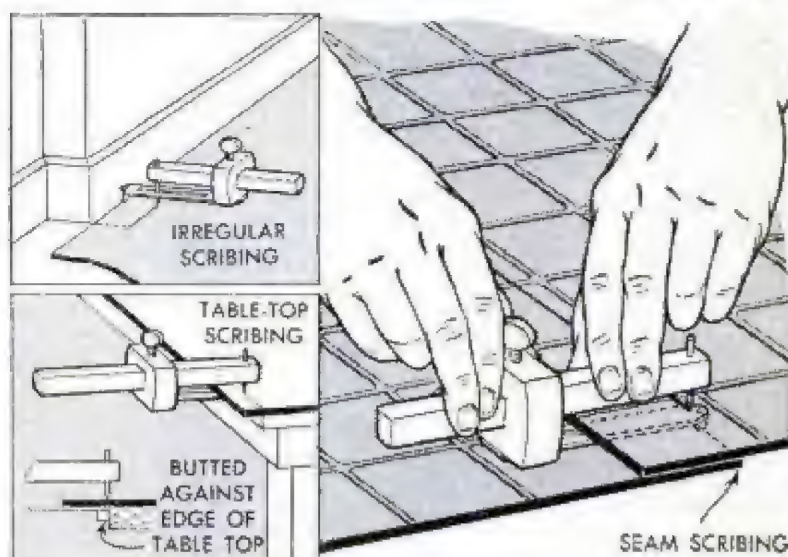
Stanley R. Welling, Racine, Wis.



There is no trick at all in obtaining neat-fitting corners and seams in linoleum if you use this simple scribing tool. It is especially useful when covering counters and sink tops which are fitted with metal edging. You can make the tool for only a few cents from a carpenter's hardwood marking gauge and a strip of metal, preferably brass or aluminum. Cut the strip to the dimensions shown in the detail and form a slot about $\frac{3}{16}$ in. wide and $2\frac{1}{2}$ in. long in the center of the strip. This is done by drilling holes at the ends of the slot and cutting out the metal. The scribing point of the gauge is placed through the slot when the tool is used to transfer a wall offset as pictured in the upper left-hand detail. Round the front end of the slotted strip and drill the holes as indicated. Turn or grind a $\frac{1}{8}$ -in. tenon on a brass guide pin, insert tenon through front hole in the strip and peen over the end to hold it in place. Finally, screw the metal strip to the sliding member of the marking gauge.

Eldon Schiel, Chicago.

Handy Scriber for Fitting Linoleum Improved From Marking Gauge



Sulphur Fumes Piped to Dens Kill Ground Hogs or Ferret Other Animals

By piping sulphur fumes into ground-hog dens, I managed to rid my farm of these animals. Not only will this method destroy ground hogs or gophers, but it is also an excellent way to ferret skunks, squirrels and other fur-bearing animals. First, a length of pipe is pushed through the entrance to the den, the end being allowed to project a few inches above the ground. The opening around the pipe is packed with

cloth or small stones and filled with dirt. Then, one or two spoonfuls of motor oil are poured into the pipe. This is followed with a few spoonfuls of sulphur, which is held to the sides of the pipe by the oil. To burn the sulphur, the flame of a blowtorch is directed into the pipe. This also forces the sulphur fumes throughout the den. When the den is filled with fumes, the pipe is pulled out and the hole covered with dirt. If the den has more than one entrance, cover the other holes before burning the sulphur, leaving enough opening in these holes to allow a little smoke to seep through. In this way, you can tell when the den is filled with the sulphur fumes. It is a good idea to drill a hole near the upper end of the pipe and attach a length of wire to it, as this will permit pulling the pipe from the hole and carrying it even though it is too hot to hold in the hand.

Luther Strosnider, Havensville, Kans.

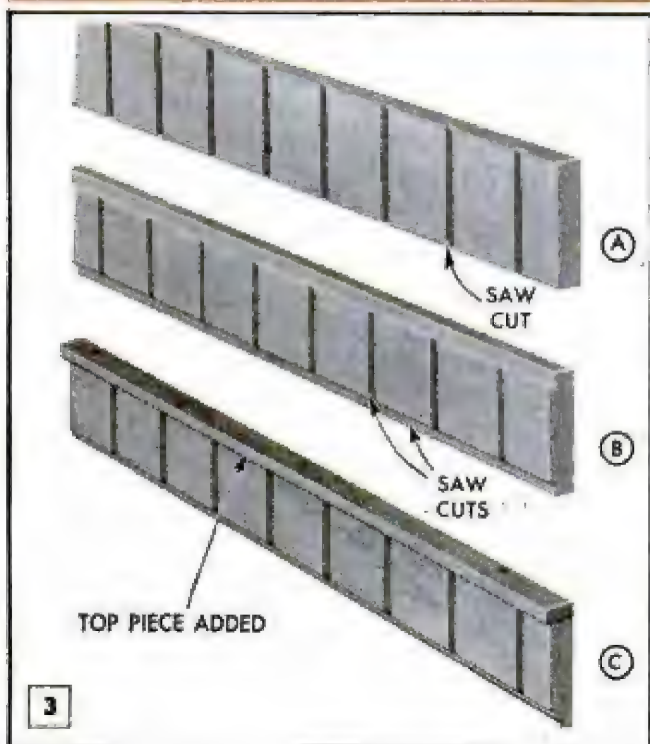
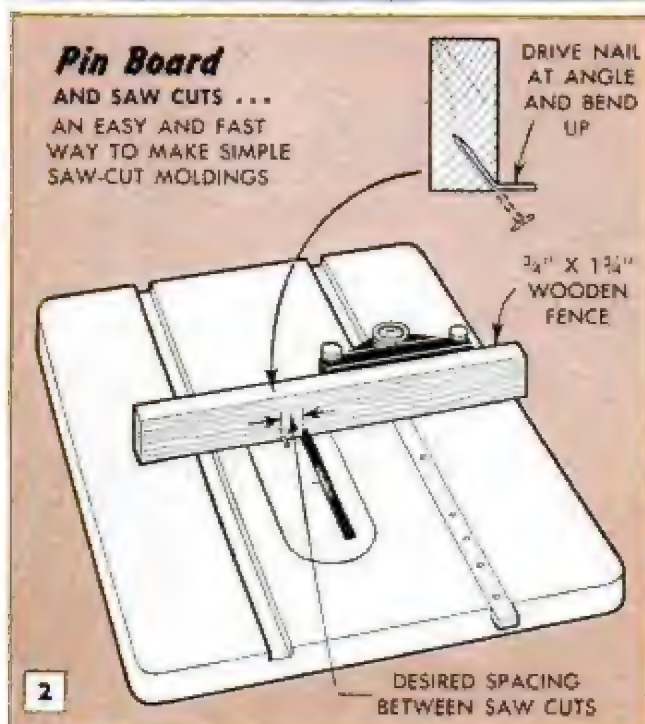


Estimating Tonnage in Coal Piles

The tonnage in a conical pile of coal can be estimated quickly. First, measure the diameter of the pile at its base. Then, multiply the cube of the diameter (in feet) by .00248 for bituminous coal or .00172 for anthracite coal.

CUT YOUR OWN MOLDING

By Sam Brown

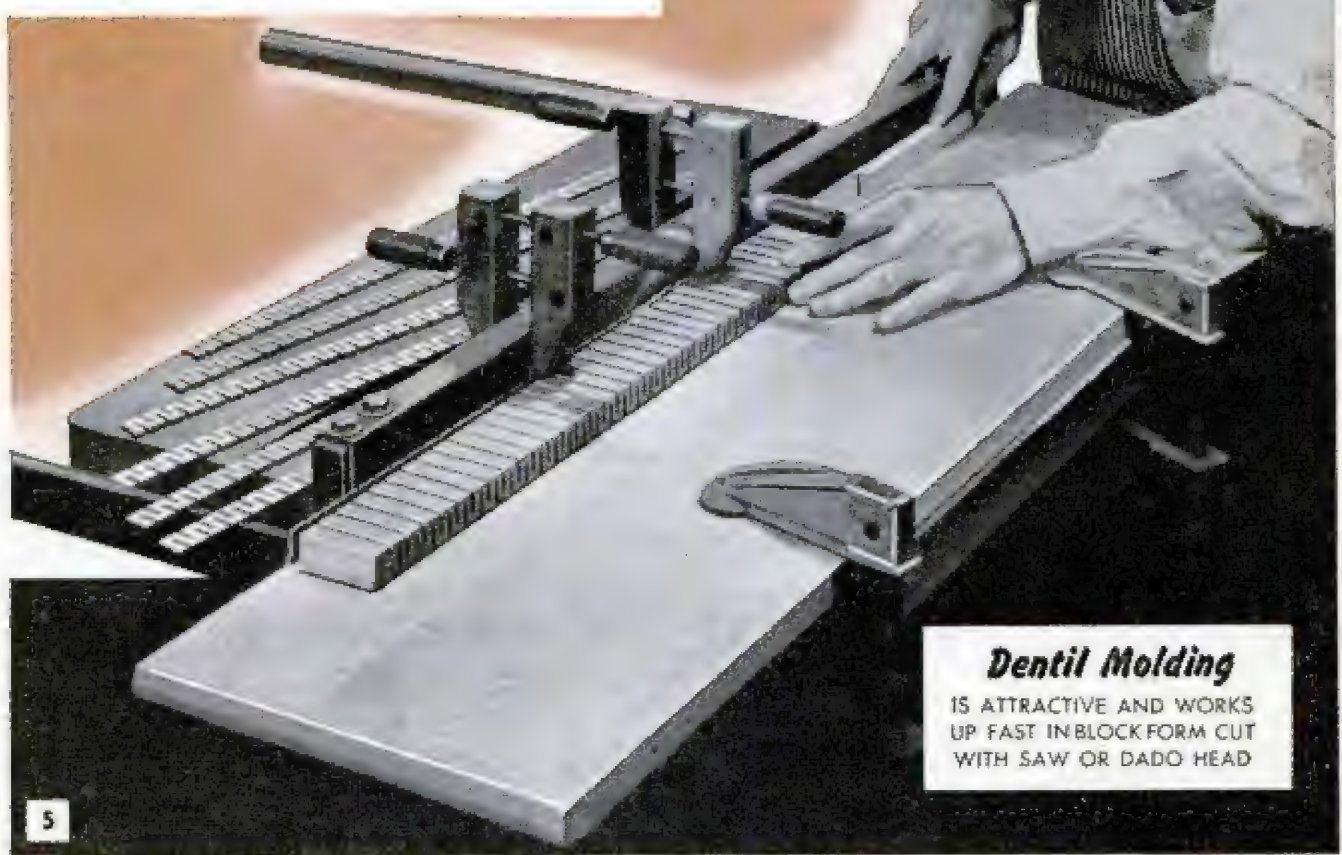
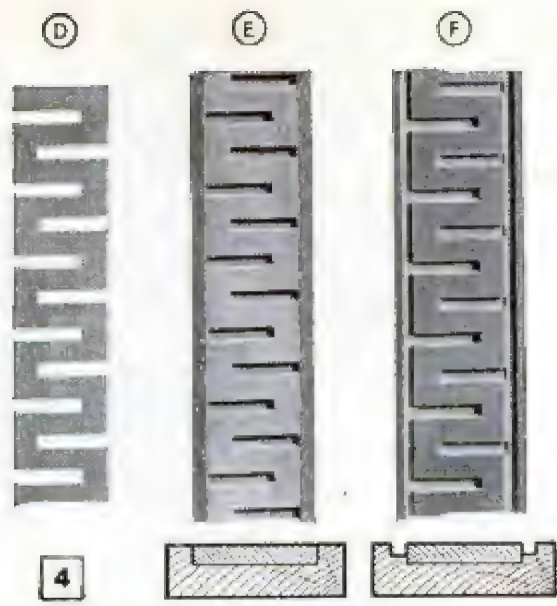


ORNAMENTAL moldings feature a pattern which repeats at regular intervals along the length of the molding. The pattern effect usually is simple, consisting merely of straight cuts, beads or coves. However, the work may be further ornamented by intersecting the crosscut patterns with a running mold cut on the edges of the piece. The details A to Z and AA to AD show 30 different styles, all utilizing simple cuts, yet offering a wide variety of attractive shapes suitable for almost any kind of trim work.

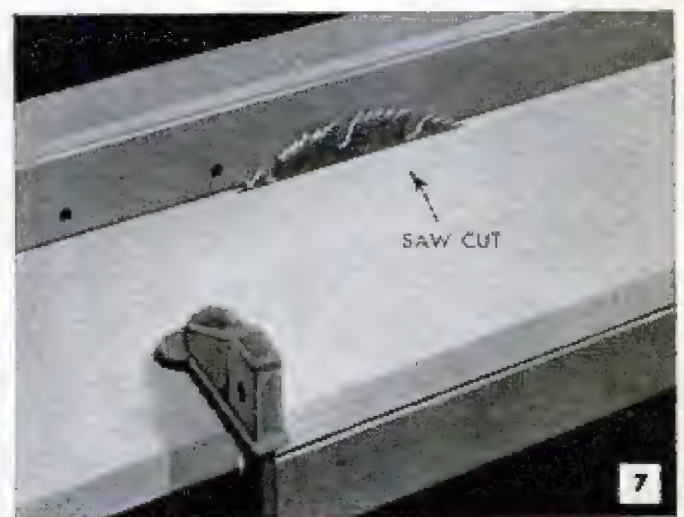
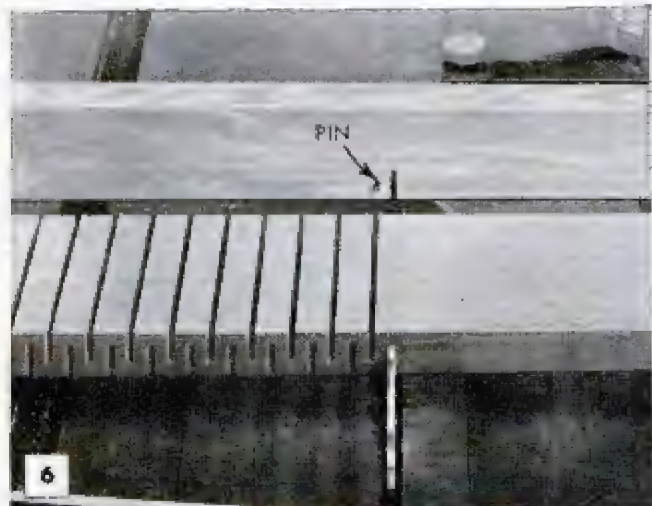
Saw cuts: Patterns worked out with plain saw cuts, or grooves, are the simplest to make. The blade used for this work preferably should be hollow-ground to assure smooth cutting. Fig. 2 shows the pin-board setup commonly used as a spacing device. As each cut is made, it is fitted over the pin, thus accurately spacing the next cut. It is easiest to work the spaced cuts on a board 3 to 6 in. wide as in Fig. 1. The piece is later ripped or sliced to the desired molding size, Fig. 4. Details B and C in Fig. 3 show how rabbets can be run on the edges of the molding to add to the appearance. Another trick is to add a second molding at the top of the original strip as shown by mold-type C in Fig. 3. By making the saw cuts different widths and varying the spacing, a variety of moldings may be formed in this manner. A wobble saw speeds this work considerably.

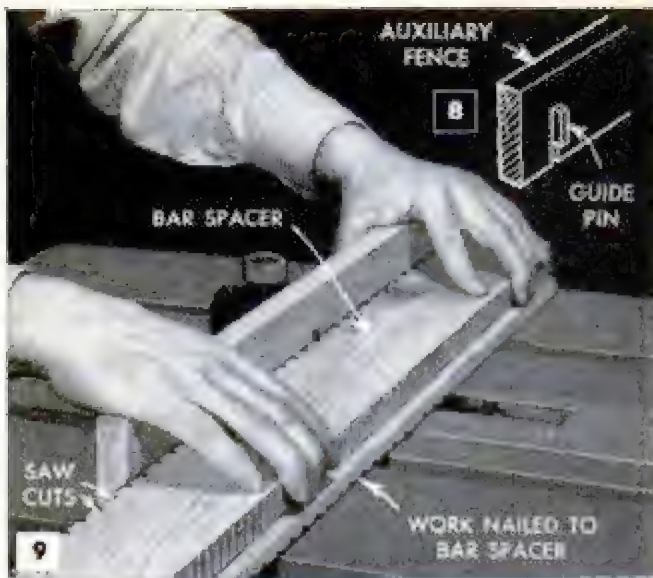
Dentil molding: This molding, details D, E and F in Fig. 4, is the most popular of the saw-cut shapes. It is worked out with the aid of a pin board by alternating cuts on both faces of the stock, Fig. 6. Then the grooved strip is sliced along the length with the setup shown in Fig. 5. To prevent the thin slices falling through the saw slot, set the ripping fence the proper distance from the blade, lower the blade below the surface of the table and clamp a board to the table with one edge against the ripping fence, Fig. 7. Then start the machine and raise the blade slowly until it projects above the board a distance equal to the thickness of the mold stock, plus about $\frac{1}{16}$ in. Then proceed as in Fig. 5, using a narrow push stick. The slices are then glued to a backing strip as in Fig. 4.

Using molding head: A molding head designed for use on a circular saw permits cutting beads, vees and coves, Fig. 12, which are the basis for certain types of ornamental moldings. The spacing setup for running these molded shapes consists



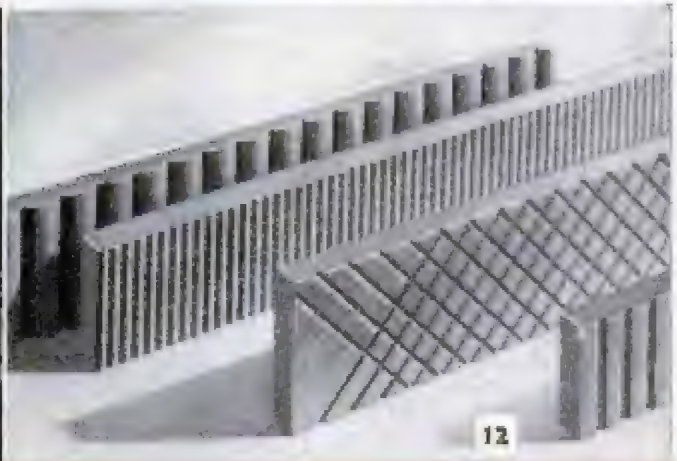
Pictured above and below is the common procedure in working out the basic dentil-mold strip on a circular saw. A block grooved alternately on both faces is sliced into strips which are glued to a base piece





Molding Head

... USED ON THE MANDREL OF A BENCH SAW PERMITS CUTTING A WIDE VARIETY OF BEAD, VEE AND COVE SHAPES BY FEEDING THE WORK SIMILARLY TO RIPPING A BOARD



EDGE SHAPES CAN BE WORKED ON SAW WITH MOLDING HEAD, OR ON SHAPER OR DRILL PRESS



G



H

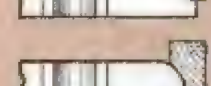
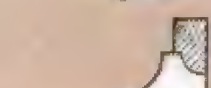
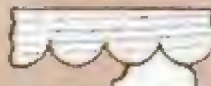
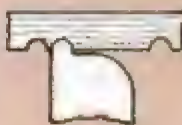


I



J

VEE AND COVE MOLDINGS



K



L



M



N



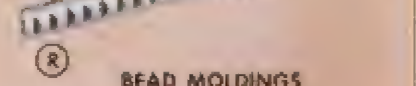
O



P



Q

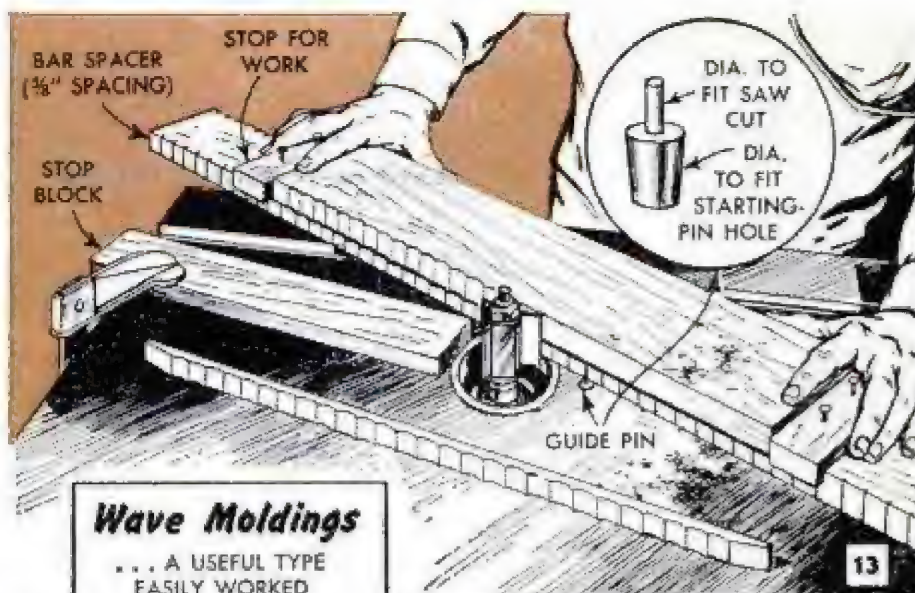


R

BEAD MOLDINGS

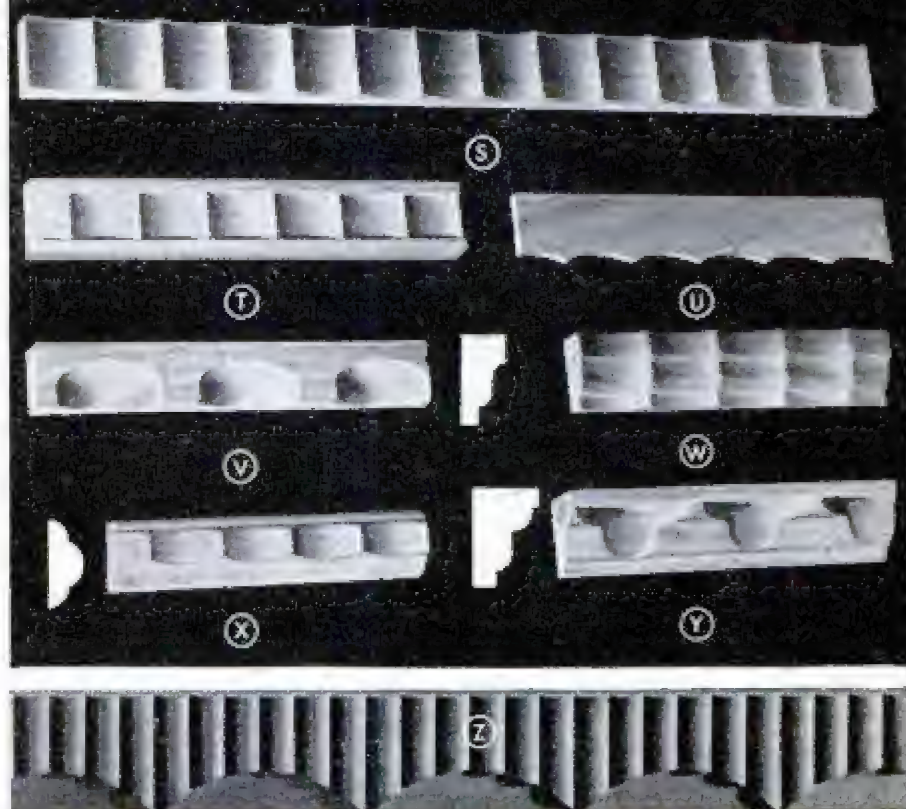
of a separate spacer bar having notches cut along its edges as in Fig. 9. The spacer bar itself is cut by using the pin board. These spacers are permanent equipment and should be retained for future use. It's a good idea to have at least two of them, each $\frac{3}{4} \times 3 \times 36$ in., having saw cuts of $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$ and $\frac{5}{8}$ -in. spacings center to center. In use, the work is nailed to the bar at each end and the spacer is then worked over a wooden guide pin mortised into the face of an auxiliary fence screwed to the miter gauge, Fig. 8. The bar spacer also can be nailed to the edge of the work, Fig. 10. Details G to R inclusive show basic cuts worked in block form. These can be ripped and then edge-molded to provide a variety of shapes, Fig. 11. Moldings K and R show how side-by-side beading cuts work out. Mold K is simply a slice off a large workpiece. L is a similar slice off a piece molded with the miter gauge set at 45 deg. Mold M is a thin slice excellent for a scalloped effect. N and O picture the scallop with standard molds run on the edges. P and Q have the shaping cuts run on the face. Style Q works up into a diamond pattern when run in narrow widths as at R. Molds G and H are made with the V-cut. Most of these cuts are run with the miter gauge set at 45 deg. Edge moldings added to the basic shape are shown at I and J. An applied molding at the top edge of the piece is often used with these styles.

Wave moldings: These moldings are interesting to work out as they offer a practical work setup which is followed through by running the mold on the edge of the workpiece and then ripping it off. The spacer bar again is used, but this time it is set by means of a small pin made especially to fit in the starter-pin hole on the shaper table. The basic cut is made with a straight shaper cutter, as in Fig. 13, and results in the shape S pictured below Fig. 13. A $\frac{5}{8}$ -in. spacing with a cutter $1\frac{1}{8}$ in. in diameter

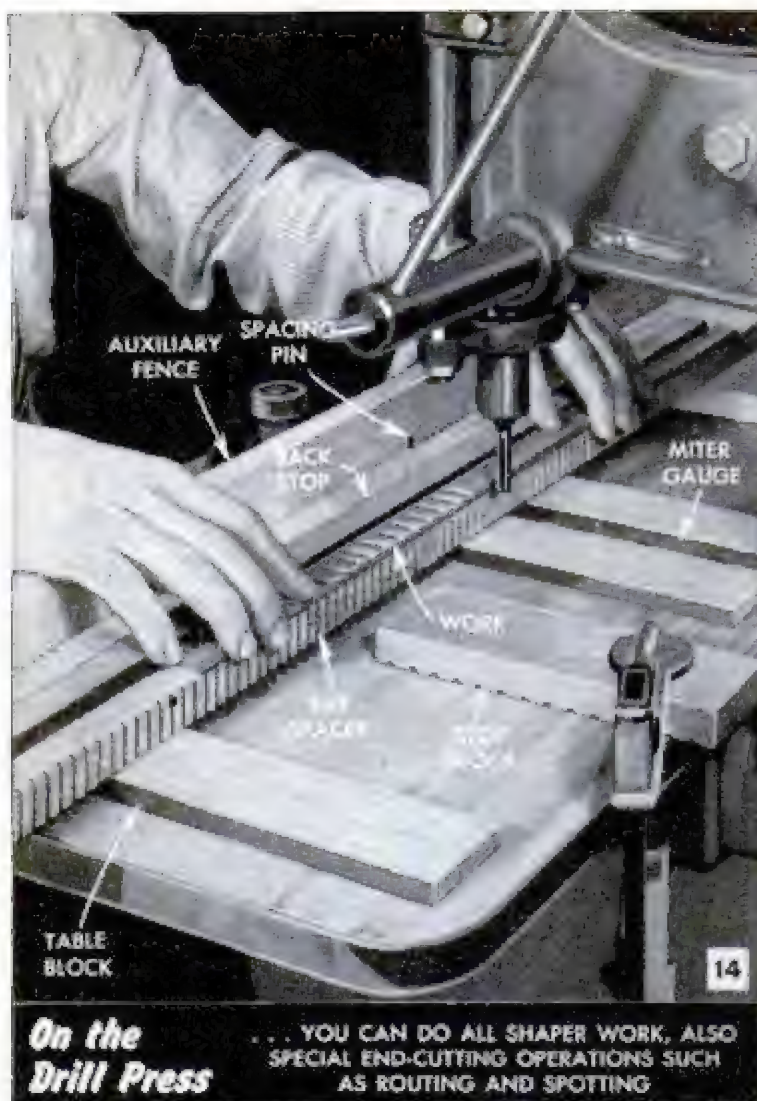


Wave Moldings

... A USEFUL TYPE
EASILY WORKED
ON SHAPER OR DRILL
PRESS WITH BAR SPACER



gives about the right form. Molds T to Z show variations which are pictured about one half full size. Mold T is the wave form run in with a cutter $\frac{1}{2}$ in. wide, and mold U is a slice from the basic mold. Extra curves, run with the conventional shaper guide collars, produce the shape shown at W. Mold V is the basic shape but the cuts are double-spaced. Molds X and Y show what happens when the wave cuts are run on regular molding shapes. Mold Z is a novel application of the wave form. The setup for running this mold requires that the work be located on the spacer bar in the same approximate position as shown in Fig. 13, except that the work must be shifted slightly to center the cut. No depth stop is used, the work being advanced into the



**On the
Drill Press**

... YOU CAN DO ALL SHAPER WORK, ALSO
SPECIAL END-CUTTING OPERATIONS SUCH
AS ROUTING AND SPOTTING



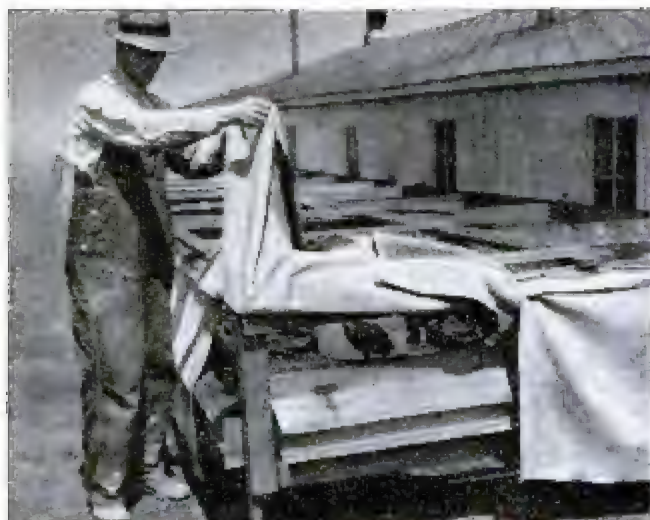
cutter until the individual cuts point up on the bead lines.

Use of drill press: Where a wood shaper is not available the drill press can be pressed into service to run most of the molding and shaper cuts commonly used in making up ornamental molds. In addition, certain end-cutting operations can be done on a drill press which are not possible with any other type of power tool. One basic mold cut made on the drill press is a stopped recess run in from one edge of the stock with a router bit. Molding AA is an example of this work. A typical setup is pictured in Fig. 14. Here you see the bar spacer used in much the same fashion as on the circular saw. The drill press is provided with a special auxiliary table large enough to support the work with additional space available for clamping stops in various positions. Only one stop is required for mold AA. Two stops will be required when running the stopped router cuts on mold AB. A conventional miter gauge sliding between strips attached to the auxiliary table guides the work into the router bit. Instead of using the straight-in miter-gauge feed, the guide pin can be fitted directly to the drill table, Fig. 15. Here the cut will be curved as on the mold AC, the radius of

curvature depending on the distance of the pin from the cutting tool. The pin, of course, acts as a pivot. If the pivot is some distance from the cutting bit, the cut will be almost as straight as when run with the straight spacer bar. Spot decorations, arranged singly or in a pattern, can be added to moldings by using various shapes of carving burrs. A common shape is the round indentation shown in mold AD. The spot is made as in Fig. 16, with the drill-press depth stop adjusted to give a uniform depth of cut. Usually it is not necessary to use the spacer bar for this job, as the spots can be located either by eye or by pencil marks at measured distances along the length of the mold strip. The cuts may be spaced by means of a pencil witness mark in line with cuts previously made.

Woods to use: The best wood for ornamental moldings is red gum in select grade. The next best selection is yellow poplar. Woods with a heavy open grain are not generally suitable. Clear white pine will do very well for most work if the molding is to be painted. Birch is a good selection for the molds formed by routing operations and for the dentil mold. Maple is too hard and dense for molding work. The wave forms work up nicely in yellow poplar.

Timely Suggestions for Better Farming



To protect poults from drafts on cool mornings, one turkey rancher tacked heavy feed sacks to the sides of the sun porches. The sacks, split at the seams, are folded upward as the day becomes warmer



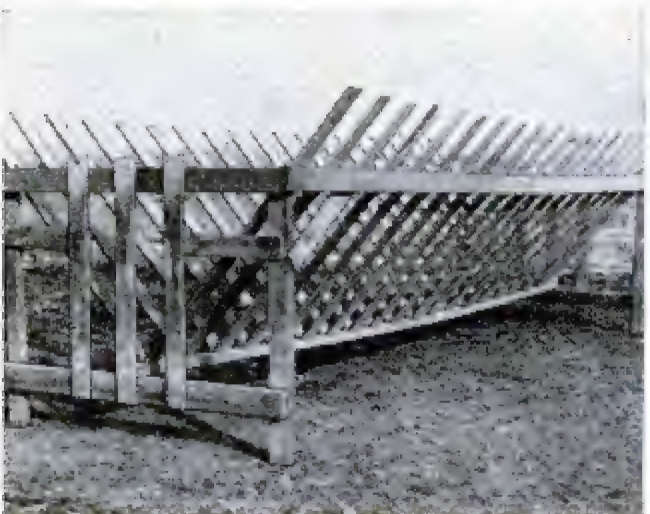
Poultry-house windows can be opened wide without fear of vermin or birds if they are covered with $\frac{1}{2}$ -in.-mesh hardware cloth. Tacked to the window frames, the cloth also discourages poultry thieves



This combination crib-and-feeding shed is a work-saving addition to the farm. Feed bunks for cattle are built alongside the crib and are filled directly from several doors conveniently located in the crib



Well-lighted barn is had by adding a long dormer to roof. The dormer is covered with cellulose glass and protected with wire netting, providing a weatherproof window which admits an abundance of light



Lightweight feed rack for sheep is used in barn or pasture, depending on the season, and can be moved on a hayrack or carried by hand. It is approximately 5 ft. wide, 16 ft. long, and 4 ft. high



Length of heavy iron pipe anchored at ground level underneath a wide road gate helps prevent soil erosion due to flow of water and passage of cattle. The pipe also keeps hogs from rooting under gate

Oil Drums Form Diverting Gates At Irrigation-Ditch Branch



Inexpensive and serviceable, two oil drums with the bottoms removed provide excellent diverting gates at a Y-branch of an irrigation ditch. The gates are sheet-metal or board covers which completely cover the upstream ends of the drums. These are held in place by water pressure and are lifted out of the way to allow water to flow through the drums. The latter are anchored with rock and dirt, and flat rocks placed in the main ditch at the end of each drum prevent water from undercutting.

E. V. Reyner, Townsend, Mont.

Removing Cap From Paint Tube



If the cap of a tube of artists' paint cannot be removed with the fingers, it can be loosened by heating slightly. Hold the cap in the flame of a match for a few seconds.

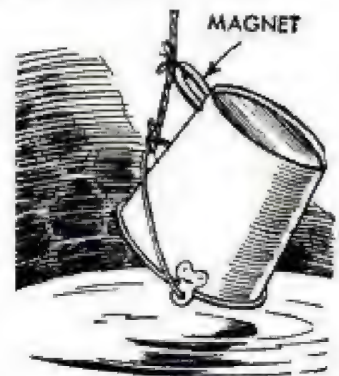
Heat-Hardening Polished Steel Without Damaging Finish

Articles of polished tool steel can be heat-hardened without damaging or scaling the finish by coating them with a mixture consisting of equal parts of table salt and fine corn meal. When exposed to extreme heat, the coating melts and forms a flux which prevents oxidation and subsequent pitting of the surface of the metal. First, dip the article in water and then in the mixture. Heat until the coating becomes glazed and dip again into the mixture. Continue the heating process and, if

any portion of the coating appears dry, spread the mixture over that point. The coating is removed by soaking in oil or water.—Leonti Thompson, New York City.

Magnet Aids Filling Cistern Pail

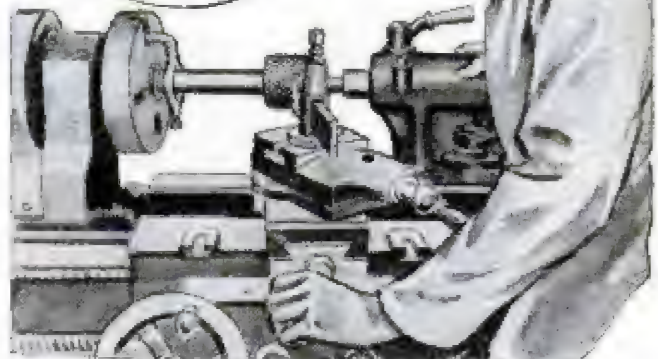
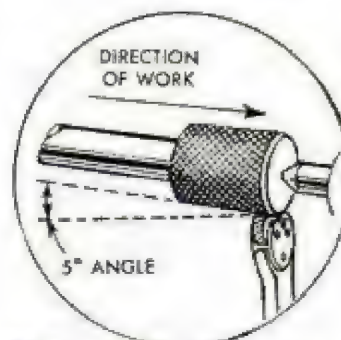
When using a pail to dip water from a cistern, it usually is necessary to pull the rope back and forth to make the pail sink and fill. This annoyance can be eliminated by tying a horseshoe magnet to the rope, as shown, to hold the pail in an inverted position. In this way, the pail will sink immediately and a sharp tug on the rope will release the magnet, allowing the pail to right itself.



Angle Setting of Worn Knurling Tool Prevents Overlapping Pattern

Setting a worn knurling tool at an angle of 5 deg. to the axis of the work will help to prevent the troublesome overlapping which occurs when the knurling wheels "climb" suddenly and spoil the knurl pattern. Feeding into the work at an angle alters the knurl pattern somewhat as the leading edge of each wheel cuts slightly deeper. In this position, the wheels cut a well-defined pattern in the first pass over the work. This results in accurate tracking and produces a clean, sharp knurl even though the wheels are worn from long use.

Glenn Lawler, West Lafayette, Ind.

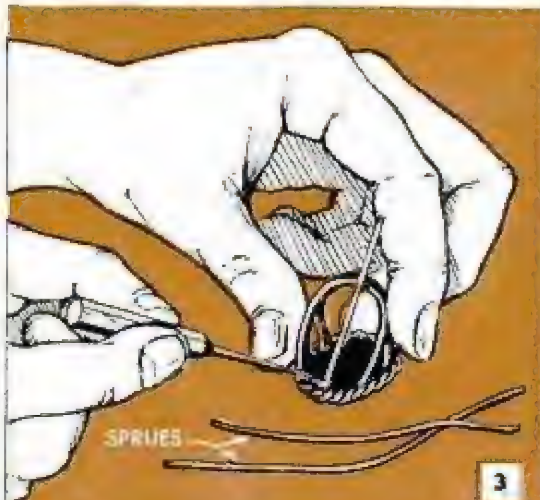




1

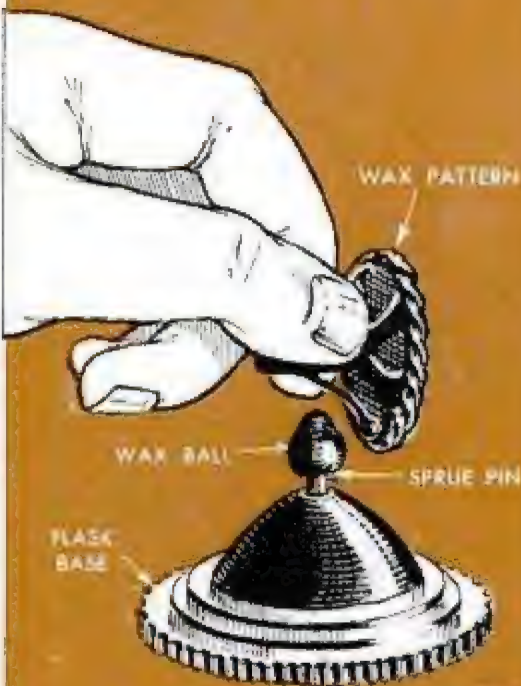


2



3

THE SPRUES ARE "WELDED" TO THE WAX PATTERN WITH A HOT NEEDLE



4

PLACING WAX PATTERN IN POSITION ON THE WAX BALL OF FLASK BASE

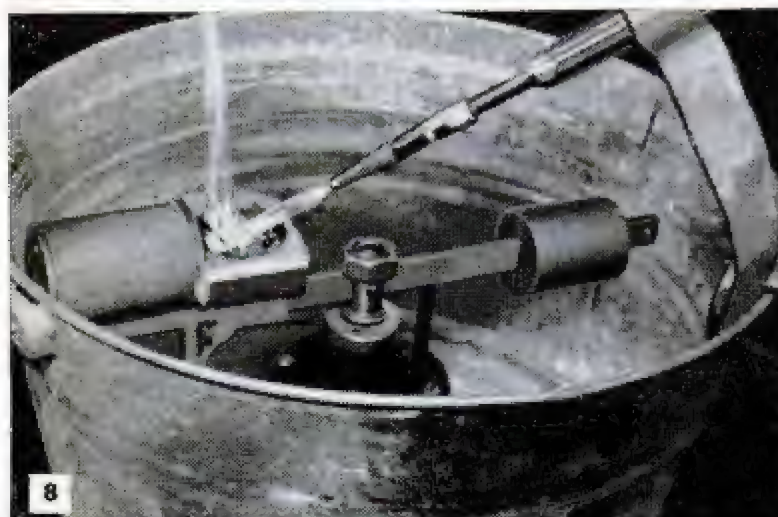
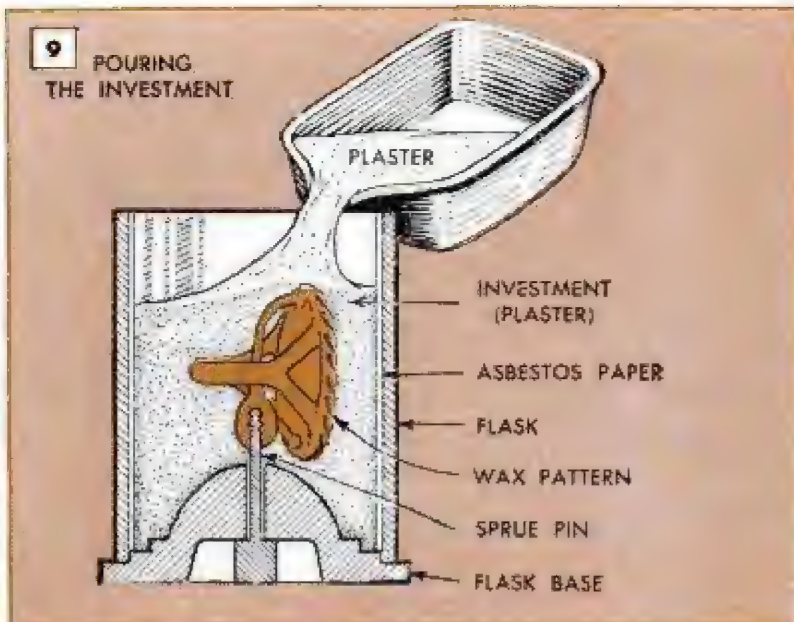
PRECISION CASTING

By the Lost-Wax Process

By Herbert C. McKay

LOST-WAX casting makes it possible for the home craftsman to reproduce in metal any form he can model in wax. Unlike sand casting, which demands experience and unwieldy equipment, the technique of this method can be learned in a single day with a minimum of special equipment. It is particularly adaptable to making small metal parts for model work and jewelry, such as the ring shown in Fig. 1. Regardless of how delicate or intricate the design may be or how high the relief or depth of undercutting on the pattern, the final casting will be an exact duplicate. In professional work, ferrous alloys are often used, but these are difficult for the home craftsmen to melt because of the high temperatures required. However, bronze, brass, gold, silver, aluminum, zinc and the white-metal alloys are easily cast.

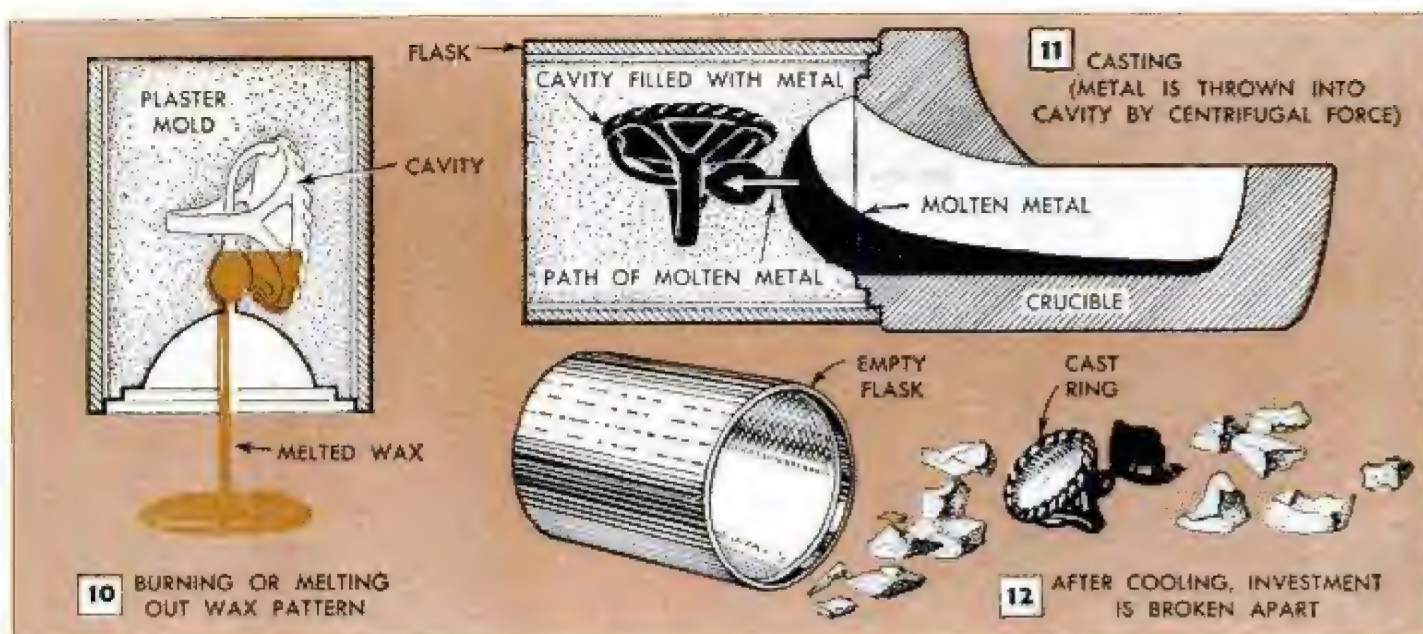
Briefly, the lost-wax process consists of making a pattern from wax, as in Fig. 3, placing it in a flask and filling the flask with plaster to form a mold, or investment, around the pattern, Fig. 9. After the plaster hardens, it is heated until the wax pattern melts and flows from the



mold, leaving a cavity shaped exactly like the pattern, Fig. 10. The mold, together with a crucible full of molten metal, is then placed in a centrifugal casting machine which forces the metal into the cavity, Fig. 11. After the metal has solidified, the casting is obtained by removing the mold from the flask and breaking it apart as in Fig. 12.

The wax, as well as the special mold plaster, can be compounded by the user. However, the centrifugal casting machine should be purchased, as the details of its design make it expensive and impractical to build. The cost of a commercial casting machine is comparable to the price of a small drill press or circular saw.

The simplest soft wax for patterns is made by mixing equal parts of beeswax and paraffin. Since paraffin is available in several different melting temperatures, it is possible to vary the hardness of the wax mixture. If the wax pattern is to be formed by cutting or carving, a still harder mixture can be made by adding ceresin and carnauba wax to the beeswax and paraffin. One mixture suitable for carving consists of equal parts of the four ingredients. Another is made from four parts each of beeswax and paraffin, two of ceresin and one of carnauba. The best method is to vary the quantities of each ingredient until you obtain a wax with the degree of hardness best suited to your needs. Regardless of the mixture, the wax must melt



and burn away completely when it is heated so that no ash or residue remains in the plaster mold.

The plaster must withstand high temperatures without breaking down, and yet must crumble easily when wet. This is usually made by mixing plaster with soapstone, asbestos lint or calcined diatomaceous earth. The best mixture for fine detail is the commercial material having a cristobalite base. A mixture containing plaster of paris, five parts, powdered coal ash, three parts, and powdered talc, one part, may be used successfully. A mixture of eight parts plaster, six parts asbestos powder and one part powdered talc also is good. The aggregates are mixed with water to the desired consistency.

A miniature gas or electric furnace or a torch can be used to burn out the wax pattern and melt the casting metal. For castings that can be enclosed within a $\frac{3}{8}$ -in. cube, a mouth blowpipe and Bunsen burner will do. For larger castings, an ordinary gasoline blowtorch, an oxyacetylene welding torch or any gas-burning torch having a forced-air supply may be used.

To make a piece of jewelry, for instance, the design is first drawn on paper to exact size. Then, using this as a guide, thin sheets of the transparent wax are laid over the design and the various shapes cut out with a sharp needle set in a wooden handle. The wax pieces are formed and then assembled by holding their edges together and touching the junction with a hot needle to weld the pieces together. When the assembly is completed, the rough places are scraped smooth with a small scraper, made from a piece of metal $\frac{3}{32}$ in. wide fitted with a handle. Small pieces of wax may be added and carved as desired. Every extra minute spent in shaping the wax pattern will save 10 or 15 minutes in dressing down the final

metal casting. Every defect in the wax pattern will be reproduced. In fact, with a little experience in patternmaking, you can reproduce minute detail visible only on the most careful inspection.

No vents are used in this type of casting. However, it is necessary to provide channels, known as sprues, to allow molten metal to reach all parts of the mold before it starts to solidify. These are made of pieces of wax, rolled into rods of about $\frac{1}{16}$ in. dia., and are fastened to the pattern by the hot-needle method as shown in Fig. 3. After the sprues are attached, the pattern is ready to mount in the flask of the casting machine. The flask is simply a length of brass pipe and a tightly fitting base which is shaped to form a funnel-like depression at one end of the plaster mold. A hole through the center of the base is fitted with a large-headed pin, the tip of which is wrapped with a length of sprue wax carefully shaped and melted into a ball, Fig. 4. The sprues of the pattern are then fastened to the wax ball with a hot needle. This holds the pattern firmly to the base in the desired casting position.

The success of the casting depends upon the care used in making the plaster mold, or investment, Fig. 9. A small amount of the investment is mixed to a creamy consistency and brushed on the pattern as in Fig. 6. The brush is used to work the investment into every detail of the pattern and also to remove small air bubbles. After covering, the investment is allowed to set until half hard but not dry. Meanwhile, the flask is lined with thin asbestos paper, wetted so it will adhere to the inner walls. The flask is then placed over the invested pattern, Fig. 7, and fitted to the base. Another batch of investment, mixed thick enough just to flow smoothly in a sluggish stream, is poured into the flask until a slight



Above, appearance of casting with sprue and sprue base after removing from flask. Tiny white spots are bits of investment. Below, sprues are cut off leaving stumps which are ground flush with casting



crown is formed above the top. After the investment is semisolid, the crown is scraped level with the top of the flask. The investment is then allowed to set until hard, after which the sprue pin is removed and the base separated from the flask. The mold, which is still surrounded by the flask, can be dried in two hours by placing it in an oven heated to about 100 deg. F., but it is advisable to let it stand overnight.

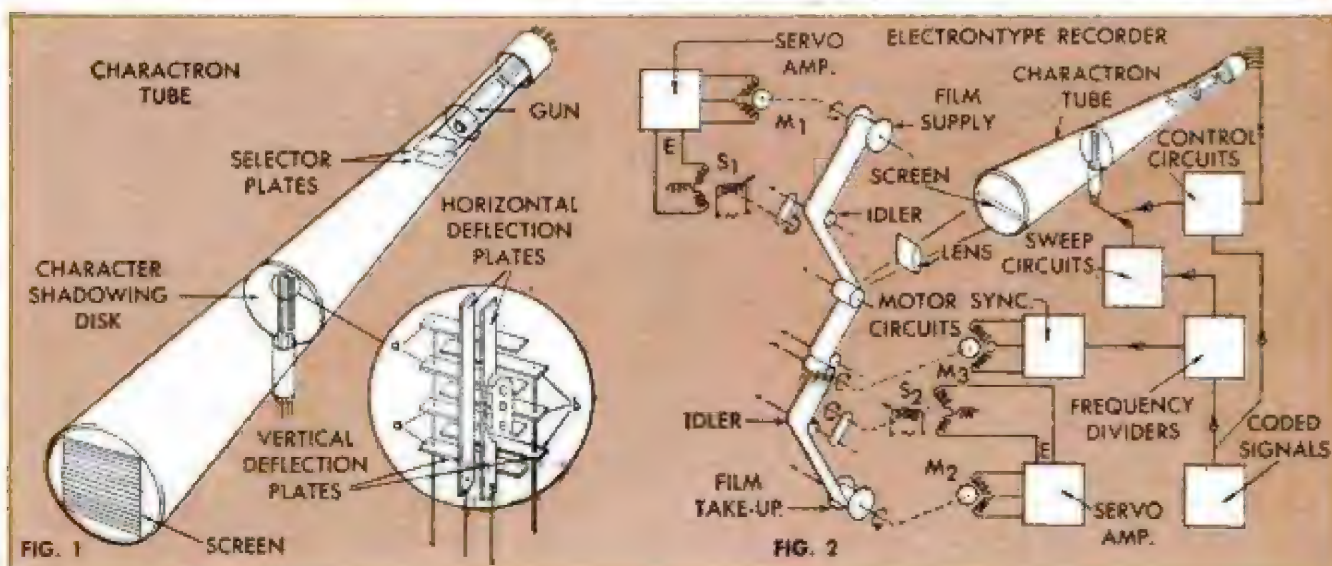
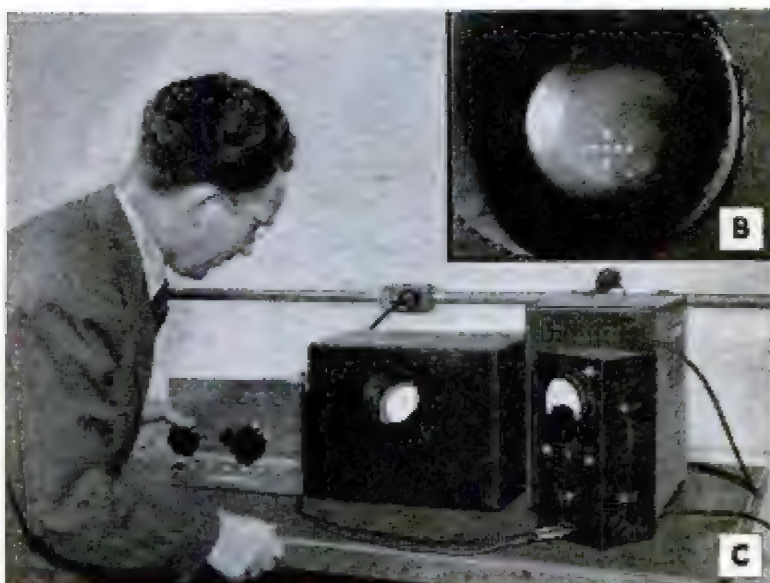
The next step is removing the wax from

the mold. This is done by the application of heat, about 500 deg. F., for a half hour. The wax melts and runs out as in Fig. 10. But, as it usually ignites and burns when it reaches the air, no wax is recovered. Hence, it becomes the "lost wax." This may be done in a furnace or by supporting the flask over a medium flame of a gas burner. After the bulk of the wax is removed, the residue must be removed by a thorough burning out. In the furnace, this is done by increasing the heat to 1200 deg. F. for one hour. If a gas burner is used, a tin can turned upside down over the flask will act as an oven chamber. At the end of the burning-out period, the flask and mold, shown held with tongs by the gloved hand in Fig. 2, is securely clamped between the crucible and thrust plate located at one end of the rotating arm of the casting machine. The other end of the arm has an adjustable weight to counterbalance the flask, crucible and metal to be cast. It is essential that this balancing be done before the cast is made. The arm is fastened to a shaft projecting above the center of a metal base inclosing a strong spiral spring which rotates the arm. In use, the arm is turned against the spring about three turns and a gravity stop pin raised to hold it in place. The flame from a gas torch is then directed on the metal in the crucible, Fig. 8, until the metal is melted. When the metal is completely melted, a pinch of borax is dropped on it, and as soon as the metal surface shows bright and clean it is ready for casting. The counterweighted end of the arm is then pulled back about $\frac{1}{4}$ in. against the spring, thus allowing the gravity pin to fall clear, to release the arm. Centrifugal force causes the molten metal to flow into the mold cavity as in Fig. 11. After four or five minutes, the flask is removed from the machine and cooled slowly by quickly dipping it 10 or 12 times in a pan of water until it is cool enough to handle. Usually, the mold and its asbestos wrapping will slide out of the flask when cooled with water. If not, the investment, which has the consistency of thick sludge, will come out easily if dug into with a screwdriver. The casting will come out covered with a film of investment, which can be removed by scrubbing with a stiff brush. The casting, Fig. 13, now duplicates the original wax pattern and part of the base, Fig. 5. The base is removed by cutting or sawing the sprues as close to the casting as possible, and the remaining stumps of the sprues are ground off flush with the surface of the casting with a small abrasive wheel as indicated in Fig. 14. In most cases, any surface discoloration on the casting will disappear when buffed with a cloth or felt wheel loaded with polishing compound.

High-Speed Communication

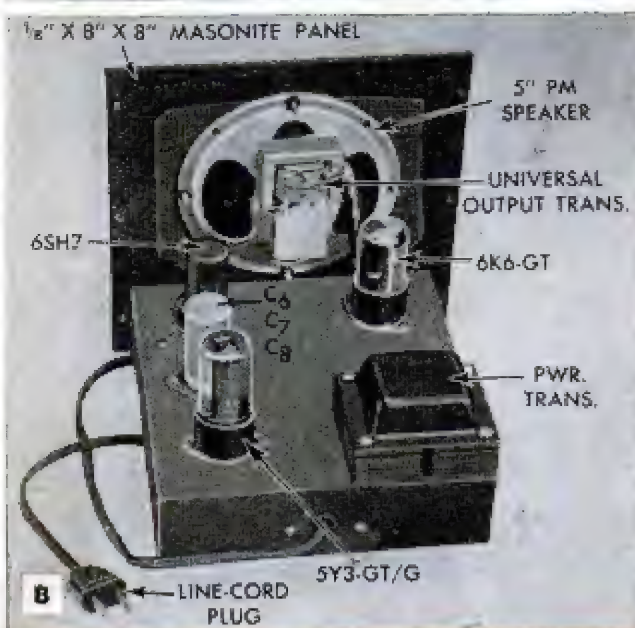
AN ELECTRONIC ultra-high-speed unit for use in the transmission and reception of messages and data has reached the development stage. It is claimed that equipment can be designed to produce messages in printed form at the rate of one million words per minute. The chief component in this Electrontype unit is a Charactron, a new type of cathode-ray tube. J. T. McNaney, who invented the tube, is shown examining one of the experimental types in photo A.

The operating principles of one type of Charactron can be understood by referring to Fig. 1. The tube represented is basically similar to the conventional cathode-ray tube, but it is equipped with means by which an electron beam can be converted into shapes of predetermined characters. At a midpoint location in the tube there is a character shadowing disk. The cross section of the electron beam is made to conform to the shapes of aperture configurations in the disk when directed through the individual openings. Electron shadows of predetermined characters can then be selectively focused on the viewing screen. A complete Electrontype recorder is illustrated diagrammatically in Fig. 2. Photo B is a close-up of the Charactron used for numerical displays. Photo C shows messages on a Charactron in response to a high-speed code transmitter.



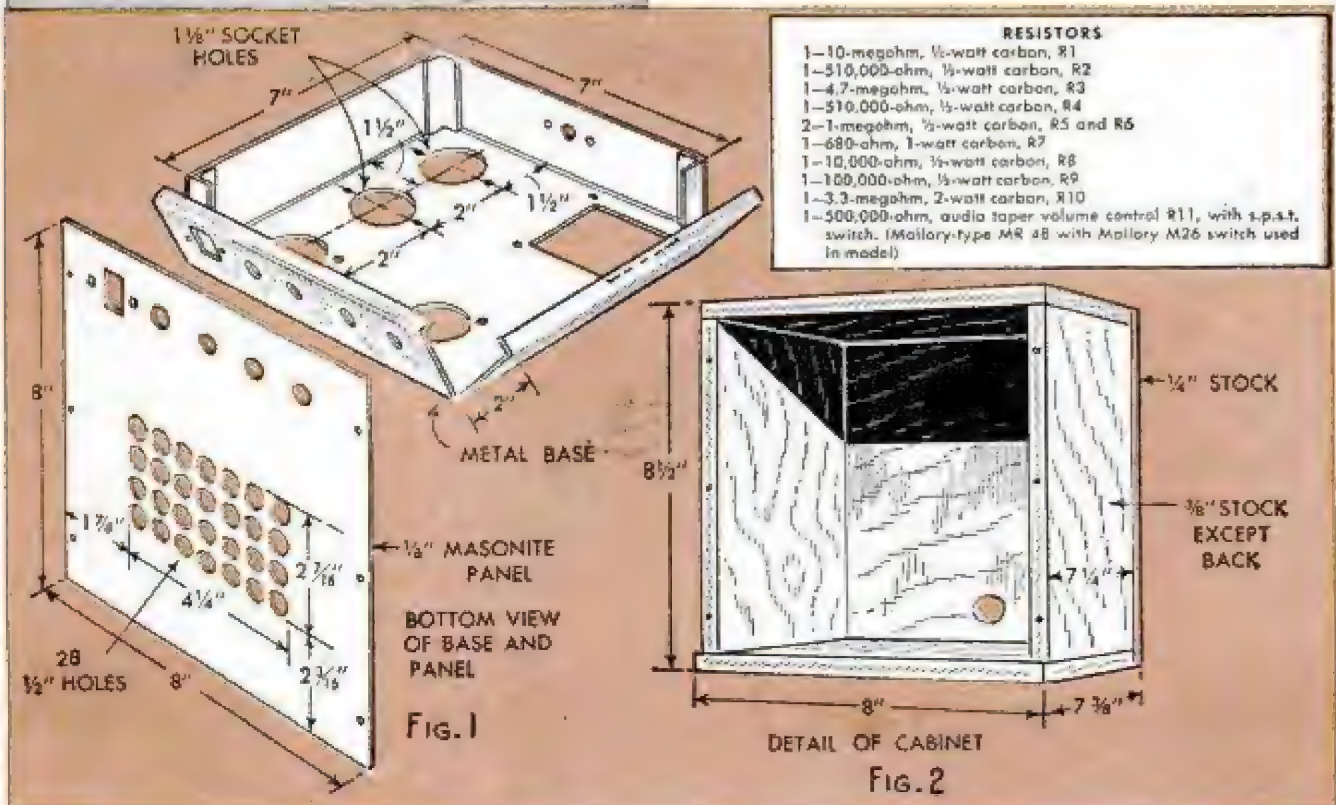
HOW TO BUILD AN INEXPENSIVE

By L. M. Dezettel



SIGNAL tracing means to sample or examine the signal at any specified point on its journey through the various stages in a receiver to the loudspeaker. It is a modern method of servicing radio sets; when you pass from a point of normal signal to the point at which this "electronic bloodhound" verifies or confirms the complaint, you have just passed into or through the defective stage. In other words, this signal tracer will quickly enable you to locate the defective stage and, in many cases, the defective part itself. It also enables you to listen to the actual signal as it is traced through the set and provides a means for checking the quality of the signal at each sampling point.

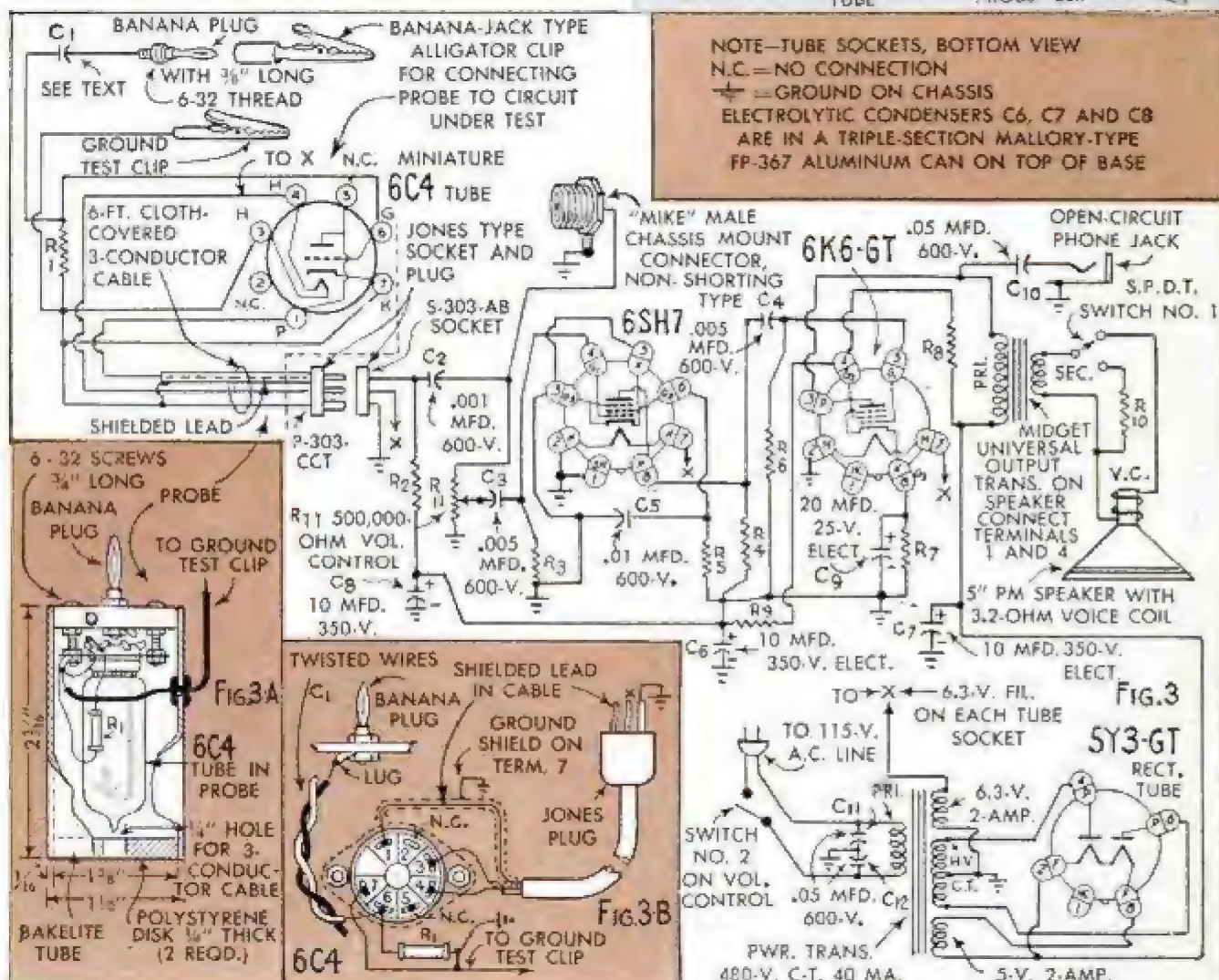
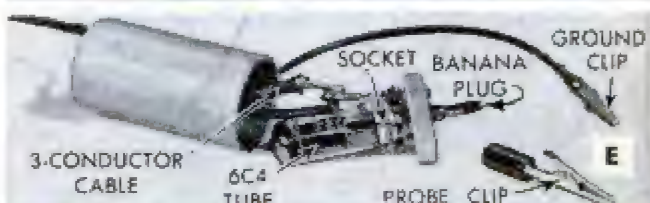
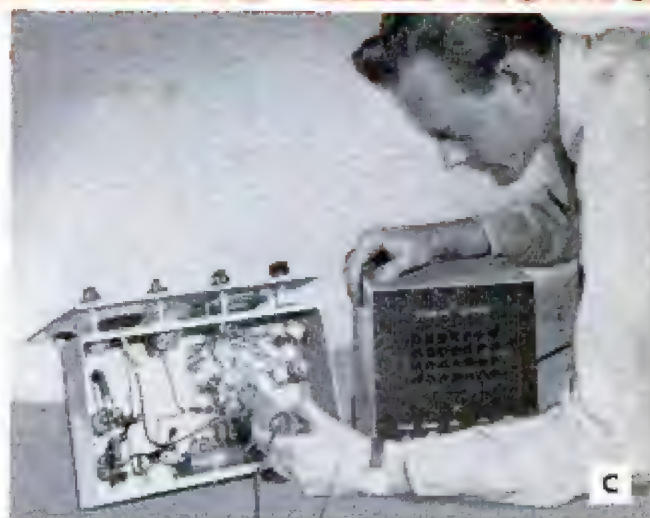
It is easy to build and simple to use as it is merely an audio amplifier with a built-in power supply and a nonlinear detector in the form of a probe. The unit illustrated consists of two amplifying stages employing one 6SH7 tube and one type 6K6-GT tube. The nonlinear detector probe, which is housed in a short length of Bakelite tubing, is connected to a 6-ft. length of 3-conductor cable, in which one lead is shielded. It employs a 6C4 tube; the cable terminates in a type P-303-CCT Jones plug. Since this is a grid-leak type of detector, it also adds considerably to the signal amplification. A 5Y3-GT/G tube is used in the conventional built-in power supply, with the additional condensers C11 and C12 employed to take

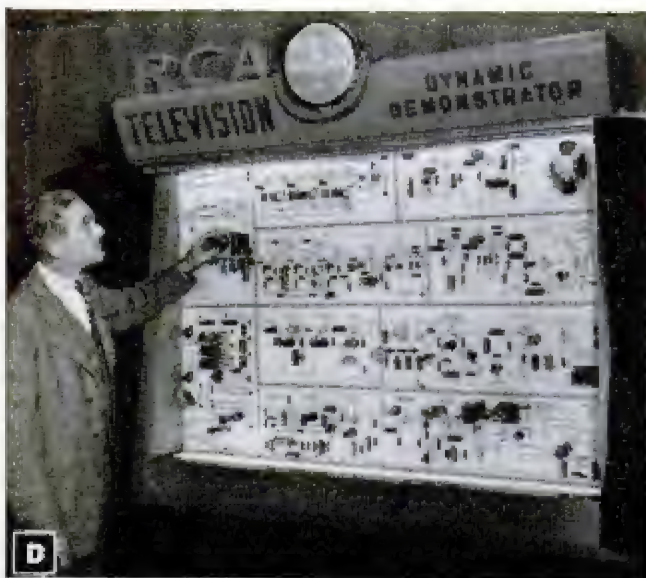
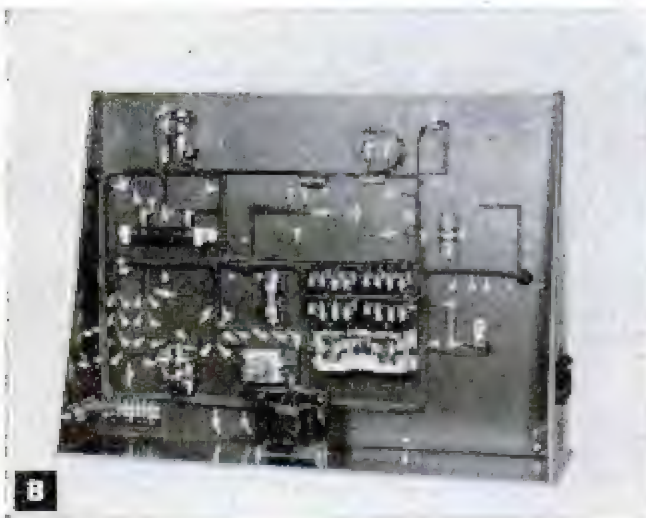


SIGNAL TRACER FOR RADIO SERVICING

out line noises which might appear in the signal tracer, because of its high amplification. Photos A, B, F, G and H show various views of the completed instrument. The metal chassis base, Masonite panel, and cabinet are all carefully detailed in Figs. 1 and 2. A complete schematic circuit diagram is given in Fig. 3. Pictorial wiring diagrams of the 6C4 tube socket, probe, and cable connections are shown in Figs. 3-A and 3-B. Condenser C1, resistor R1 and the 6C4 miniature tube are all contained within a 1½-in.-dia. piece of Bakelite tubing which is closed at each end with a disk of ¼-in. polystyrene. This is a clear plastic insulating material that is available from all radio-parts houses. Condenser C1 consists of two pieces of insulated hookup wire 1¼ in. long twisted together to provide a necessary small capacity; note that only one end of each wire is connected, as indicated in Fig. 3-B. Photos D and E show the completed probe and cable. The banana plug is the actual probe which is used to contact the various parts of the receiver. It picks off either an R.F., I.F., or audio

(Continued to page 222)





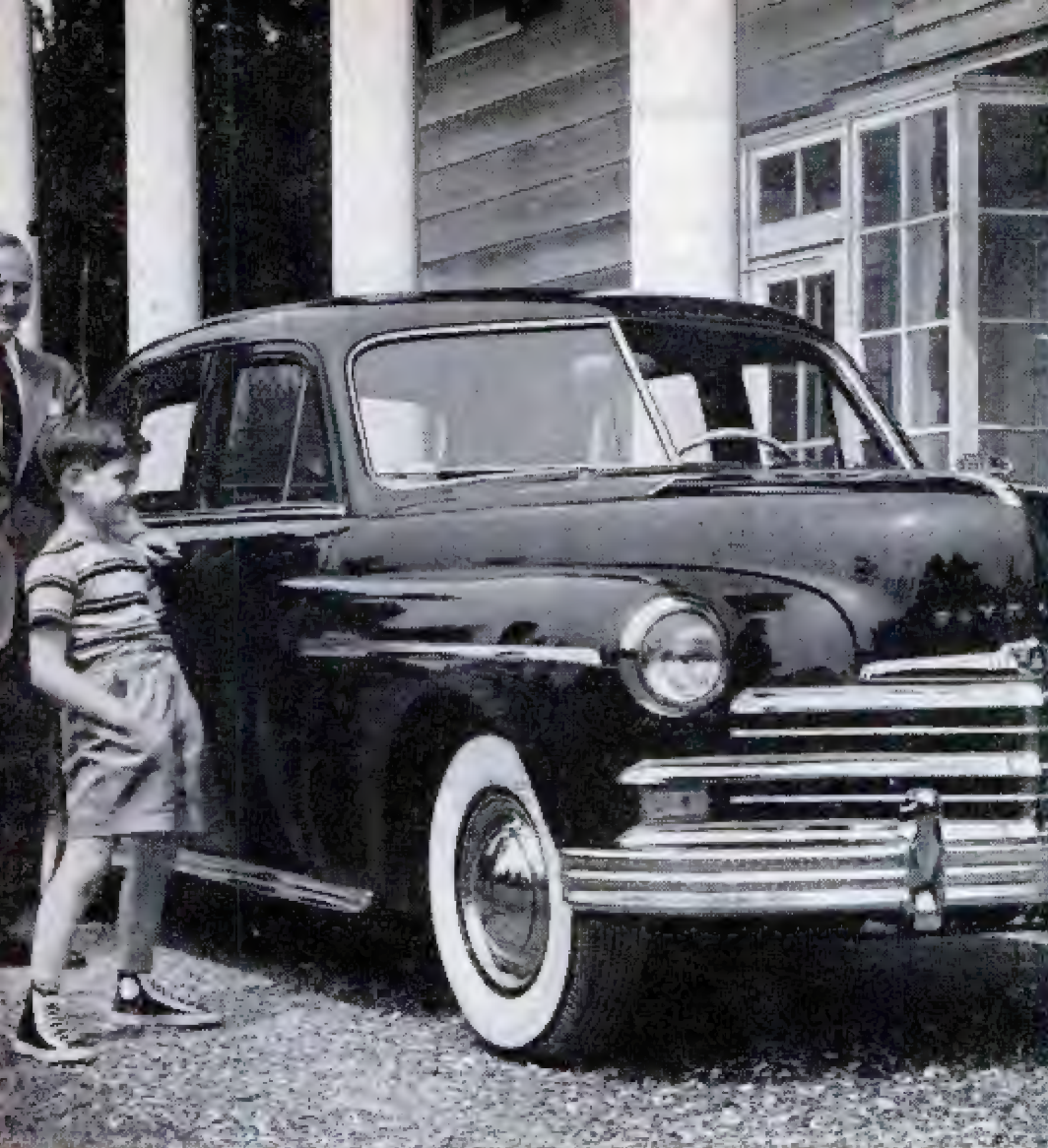
DEMONSTRATION PANELS

For Teaching TV and Electronics

DEMONSTRATION panels, or "operating blueprints" have proved to be valuable aids in teaching radio and electronics to large groups. Recently announced as commercially available by the educational section of General Electric's Apparatus Department, the demonstration panel illustrated in photos A, B and C, aids in teaching the principles of industrial electronic motor-control circuits. It is similar to the standard Thy-mo-trol drive which provides adjustable speed from an a.c. source. A type GL-5545 thyatron tube supplies the armature current and a type-83 rectifier tube supplies the field current.

The equipment, in kit form, to be wired by the students, includes the panel, tubes, push-button station, a fractional-horse-power motor, wire and all components. All control parts except the tubes are to be mounted on the back of the 22 x 31-in. unit. The circuit diagrammed in white on the black self-supporting panel, has been laid out with emphasis on its educational value to simplify the teaching of phase shift, d.c. bias effect, thyatron grid control, etc. More than 20 sets of jacks provide for the measurement of current or voltage at all important points in the circuit, while additional contactors and jacks make possible the control of auxiliary equipment. The d.c. motor may be started, stopped, reversed, and its speed varied from 50 to 1725 r.p.m. from the remote-control push-button station.

The introduction of a new Television Dynamic Demonstrator, at the recent national convention of the Institute of Radio Engineers, brought the demonstration-panel idea into the television field. Developed by the RCA Tube Department and shown in photo D, this panel is a complete operating, 30-tube television receiver spread flat on an upright panel for the study of TV service conditions and the training of servicemen. Resembling a giant operating blueprint, the demonstrator panel is 3½ ft. high by 5½ ft. wide. Tubes, resistors, capacitors and other components are plugged into outlets connected by wiring on the back of the panel, while their relationship is shown by a circuit diagram on the panel's face. Parts may be removed individually, or in various combinations to simulate difficulties encountered in servicing television receivers. The signal is picked up with a conventional television antenna and high-quality images are presented on a standard 10-in. picture tube mounted on the panel.



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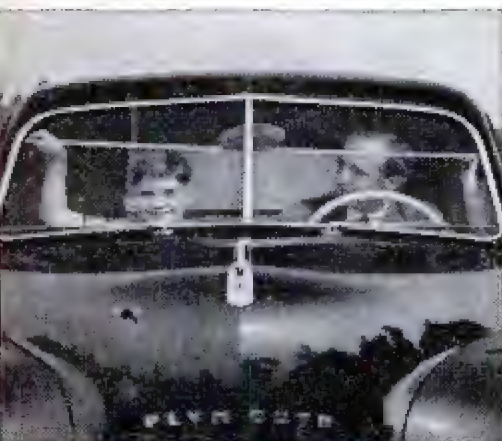
The car that
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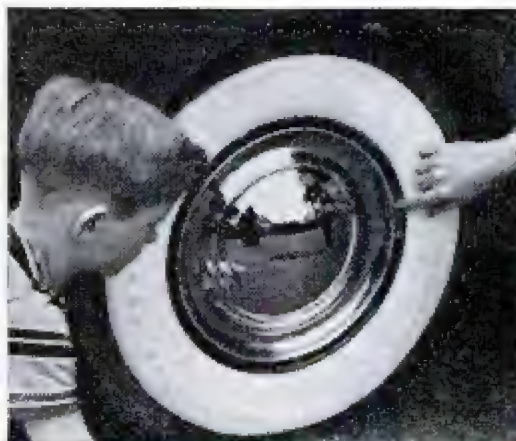
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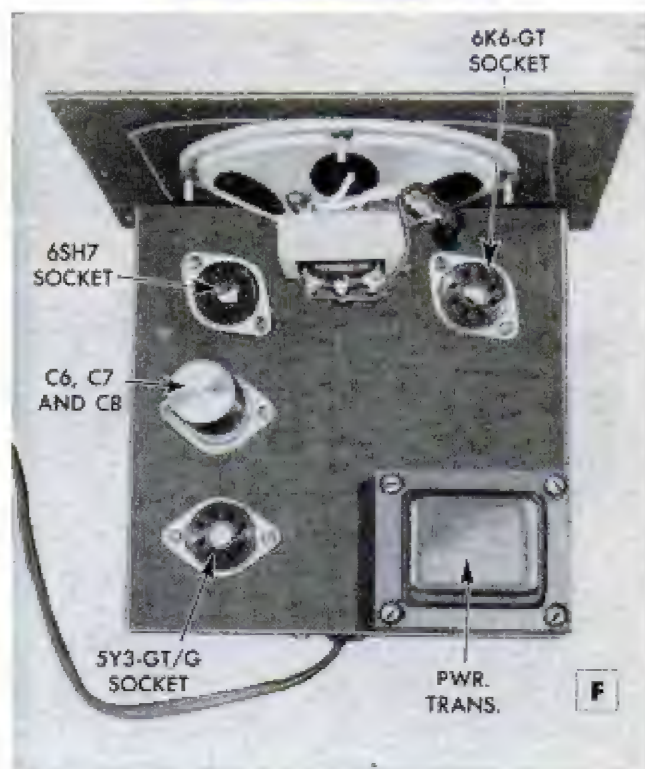


BEARINGS

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How to Build an Inexpensive Signal Tracer for Radio Servicing

(Continued from page 219)



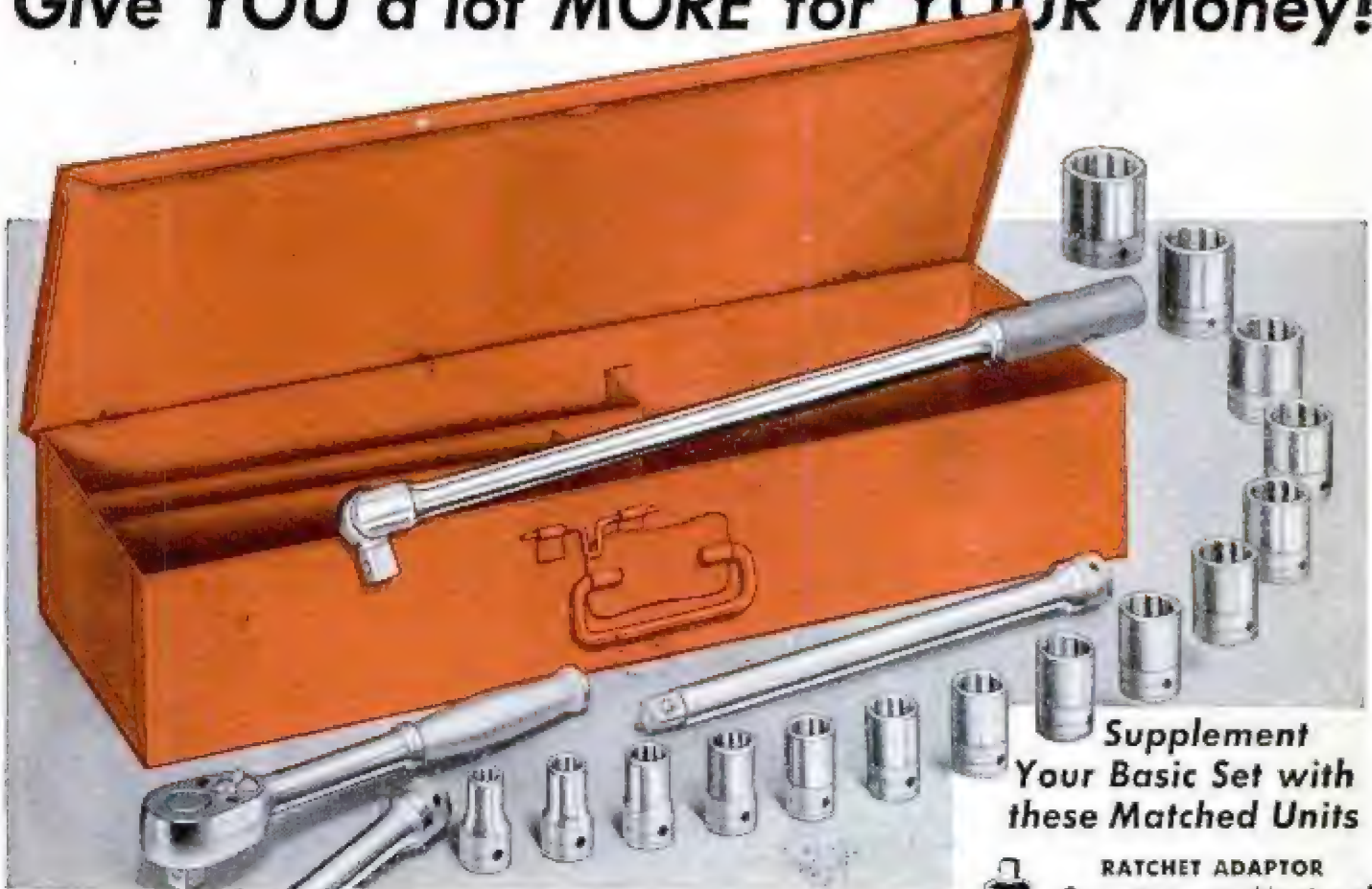
signal. For R.F. or I.F., the signal is detected in the 6C4 tube and converted to audio where it is further amplified in the other two tubes for operating either a loudspeaker or a set of headphones. Switch No. 1 cuts in a dummy load when phones are used. With the microphone connector you have a 2-stage public-address amplifier should the emergency ever arise.

When arranging the parts on the chassis base, mount them so as to make all connections between the various terminals as short as possible. All "hot" wires associated with the output circuit, such as the plate side of the 6K6-GT, must be well separated from any wires associated with the input or grid side of the 6SH7 tube. Leads and components connected to grids or plates of either tube should have the shortest possible length; clip the pigtailed of resistors and condensers where necessary to keep these leads short. In common practice, the signal tracing procedure is to work backwards from the loudspeaker towards the antenna circuit. Always guard against possible shock by disconnecting the receiver from the power line and use the alligator clips to make the necessary circuit connections each time the probe is moved. Assuming that you have a "dead" receiver but your meter indicates plate and filament voltage to the tubes, you begin with your signal tracer by connecting the ground clip to the chassis of the set and check at the

(Continued to page 224)

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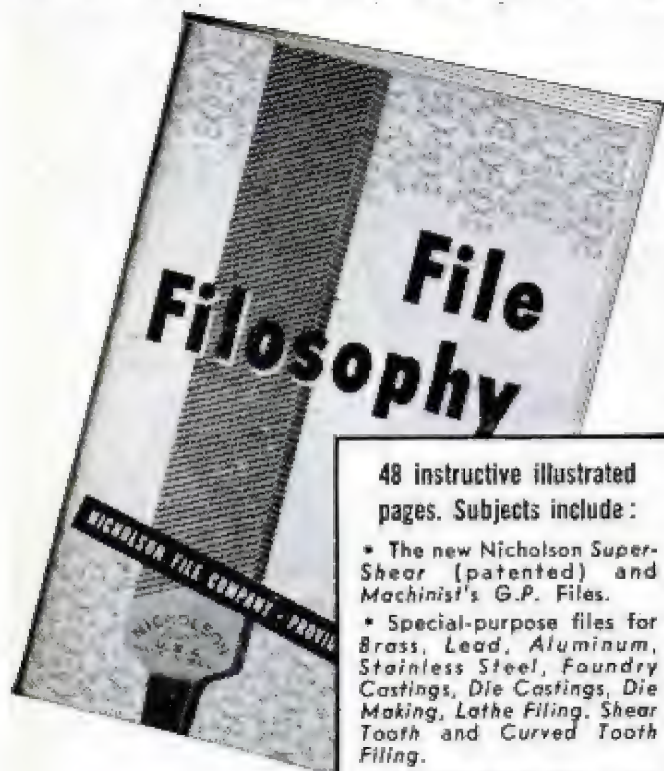
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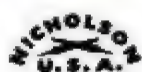
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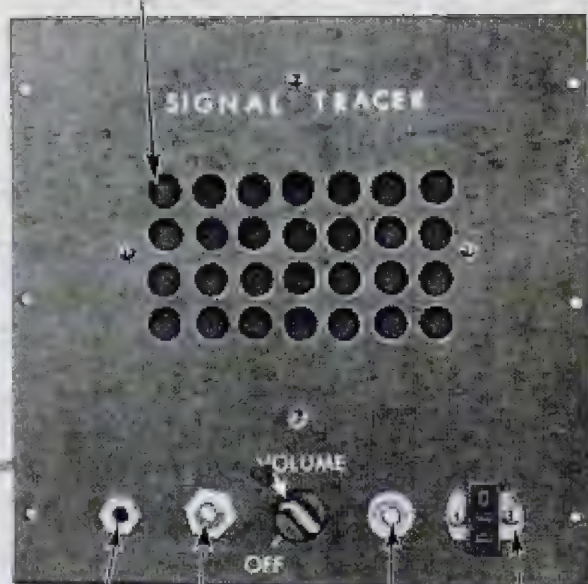
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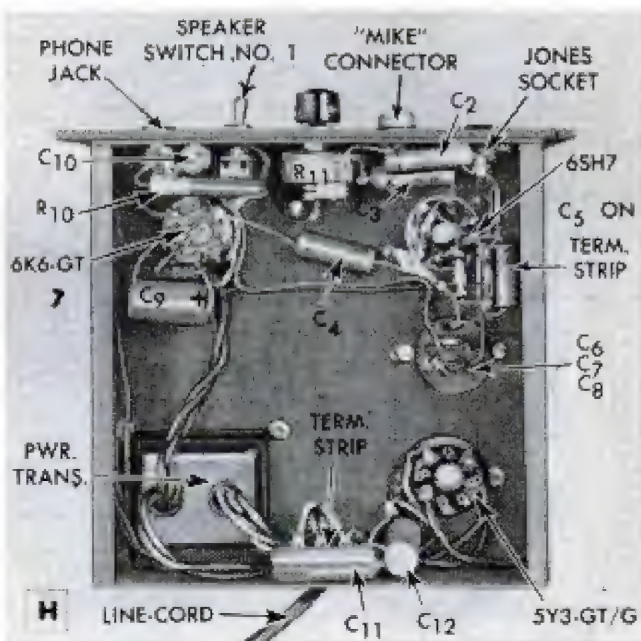
(State if home craftsman, regular mechanic, or other file user.)

SPEAKER-GRILLE HOLES
1/2" IN DIA.



G

speaker voice-coil leads. Then go to the plate terminal of the output stage and next to the grid terminal of the output stage, etc., until something is heard in the loud-speaker of the signal tracer. The best points of contact are usually the grids or plates of each of the tubes (except the power-supply rectifier tube), checking every tube all the way back down the line until the signal is heard. When the signal is heard, this is your indication that immediately following this point, there is a failure in the receiver itself. Thus, by process of elimination, you are able to find the cause of the trouble. Detailed student material list R-380 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.



H

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Flowers That Never Fade

(Continued from page 155)

showcase displays, as bouquets in the home and for party-going corsages.

Someone once asked Mrs. Harshbarger to make some stephanotis. She thought at first that this must be a kind of disease, but discovered that it really is a small, white flower that is popular for bridal wreaths and bouquets. A search of available flower-making literature and manufacturers' catalogues failed to reveal a word about this blossom. Finally, she was able to obtain some actual blossoms which are very small and composed of extremely delicate and tiny parts. But she managed to make acceptable reproductions, although she had to create all of the parts herself.

In an attempt to keep up with new developments, Mrs. Harshbarger collects specimens of flower-making work from Europe, South America and other parts of the world. Some of these examples are excellent, some inferior. She believes that many flower craftsmen do not take the pains necessary to reproduce all the essential details. She is a perfectionist and tries to make every petal, every sepal and leaf and every other part resemble as closely as possible the model Mother Nature built.

Mrs. Harshbarger has won several prizes with her flowers in hobby competitions. The first was a highly-prized "Oscar" she won in a free-for-all contest against such veteran hobbyists as coppersmiths and model builders. She has exhibited her flowers in various Midwestern cities and plans to show them on the West Coast soon.

Auto Race to the Clouds

(Continued from page 145)

This type car is well suited for road racing and turns in a good performance on the Peak highway, the motor developing in excess of 300 horsepower.

Fans were treated to an unexpected surprise last year when Herb Bryers of Colorado Springs, a newcomer to the hill climb, kicked over the "dope bucket" by taking second place in the race, beating out such drivers as Unser, Mauro and Snowberger.

The race is a dash against time, which adds a psychological obstacle for the drivers inasmuch as the official times are not released until the last car has finished its run. Each driver, therefore, must run at maximum speed even though he might have a comfortable lead. The clocking of the event is a problem because three to four cars may be on the course at one time.

(Continued to page 232)

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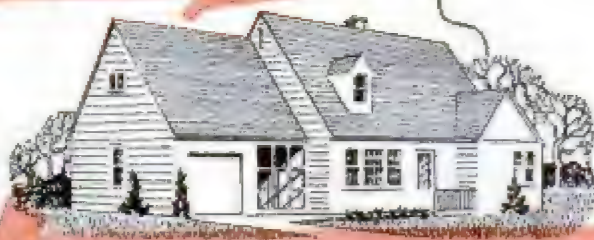
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Preventing Household Tools From Rusting

Q—I have a number of household tools, hand drills, saws, hammers, chisels, brace and bits, files and the like, which I keep in a metal toolbox in the basement. It seems almost impossible to keep these tools from rusting, especially during the summer months. I keep the tools coated with a light machine oil but even so, when I take a tool out of the box, there usually will be a spot of rust somewhere on the bright metal parts. What can I do to prevent this?
C.D.—Sioux City, Iowa.

A—In the basement where the humidity usually is high during the summer months, moisture tends to collect in any closed box or other container. This is due chiefly to a lack of air circulation and, of course, inadequate ventilation. When the tools coated with oil or grease are placed in the toolbox, some of the oil may be rubbed off or, if one tool touches another, the oil coating will be absorbed or displaced at the point of contact, leaving the metal without a protective film at this point. Several rust-preventing liquids now are available which can be applied to metal surfaces with a brush. These set lightly after application and form a thin film which is impervious to moisture, does not rub off easily and is not readily absorbed by contact with other materials. This product is available at any well-stocked hardware store.



Smoke-Pipe Corrodes

Q—The long smoke pipe leading from my furnace to the chimney gathers drops of moisture during the summer months and corrodes badly. In fact, the pipe is in such poor condition that it must be completely renewed every two heating seasons. What causes this corrosion and is there any sure remedy?
A.W.—Freeport, Ill.

A—Residues of combustion which collect in the pipe during the heating season combine with moisture to form certain corrosive acids. There really is no complete protective procedure against this corrosion which is practical to carry out, except to remove the pipe at the end of the heating season, clean each section as thoroughly as possible and then store the parts in a dry place. This procedure probably will add at least another year to the serviceable life of the pipe. Cast-iron smoke pipe, although comparatively expensive, has a serviceable life of 10 years or more.

(Continued to page 230)



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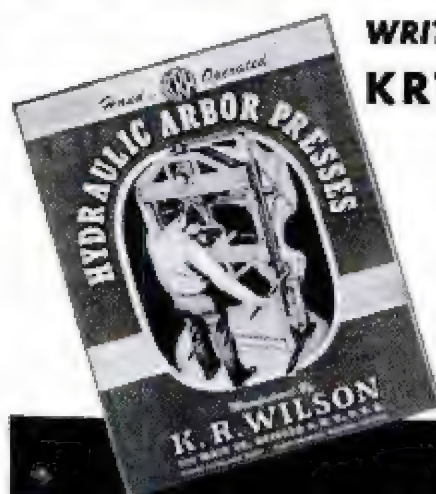


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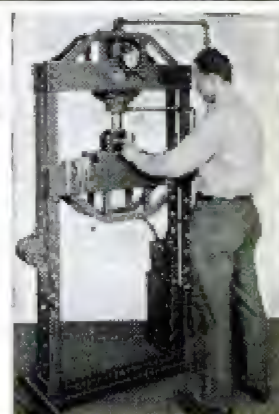
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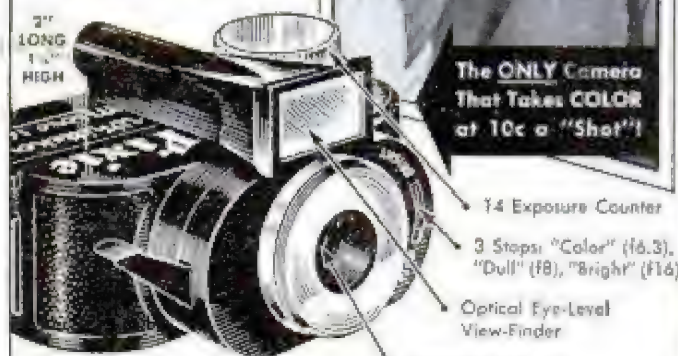
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Best Time To Paint

Q—What is the best time to paint a 20-year-old house that already has been painted a number of times? The painted siding seems to be in good condition and the paint coat unbroken but when the fingers are rubbed over the surface they come away coated with a chalky substance which I suppose is some ingredient of the paint. Can I apply paint over this surface and when during the year is the best time to do it? W.S.—Malden, Mass.

A—Judging from your description of the condition of the painted surfaces you are fortunate, as it should require only a light dusting to prepare the building for repainting. Just when to paint depends on local weather conditions, of course, but in general paint can be applied any time when the surface is dry and the temperature is fairly certain to remain above 60 deg. F. until the paint is dry. Do not apply house paint on hot, humid days or any time when a high wind is blowing as the surface may become coated with dust. The best time to paint a house is during a prolonged period of clear, cool weather, as the humidity usually is quite low and drying conditions ideal.

Circular-Saw Speeds

Q—How does one calculate the proper size pulleys to use when setting up a small circular saw for use in the home shop? I want to drive a 6-in. diameter blade at the proper speed and I don't know how to figure the pulley sizes required.

R.T.—Little Rock, Ark.



A—Manufacturer's specifications for the operating speed of a 6-in. saw blade vary somewhat, but around 5000 r.p.m. is a fair average. To find the diameter of the driving pulley where the speed of the motor and the diameter and speed of the arbor pulley are known, use this rule: Multiply the diameter of the driven (arbor) pulley by the required arbor speed (r.p.m.) and divide by the speed (r.p.m.) of the driving pulley. For example, the speed of the motor is 1725 r.p.m., the required speed of the arbor is 5000 r.p.m., and the diameter of the arbor pulley is 2½ in. Then,

$$\frac{2.50 \times 5000}{1725} = 7.246 \text{ in. or } 7\frac{1}{4} \text{ in.}$$

the required diameter of the driving pulley. However, for intermittent work such as that in the home shop it is not necessary to drive a 6-in. blade at 5000 r.p.m., as it will do satisfactory light work at much lower speeds. A fair rule of thumb is merely to double the diameter of the arbor pulley—that is, if the arbor pulley is 2½ in. in diameter use a 5 or 5½-in. pulley on the motor.

Removing Calcimine

Q—Recently I tried washing off calcimine in two rooms of my home. It washes off quite easily on some fairly large areas but no amount of rubbing will remove all the coating in some spots on both walls and ceilings. Is this oil paint, or what? What can I use to remove it? G.A.—Portland, Ore.



A—Probably oil paint as you suggest, but there also is a possibility that it is some other type of wall coating, such as washable calcimine or perhaps a water-emulsion paint. In washing, you obviously are removing only the last application of calcimine from these areas. It is suggested that you first try a paste-type paint remover on the spots where the coating resists removal. Apply the paste remover with a putty knife and allow to stand for an hour or more. Then, if the coating in question is an oil paint, it should scrape off easily. Manufacturers of water-emulsion paints supply special removers for use on these wall coatings.

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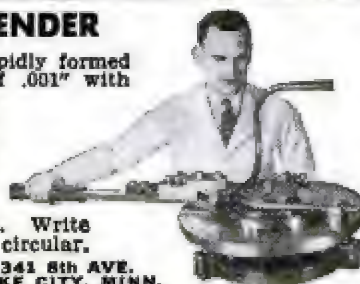
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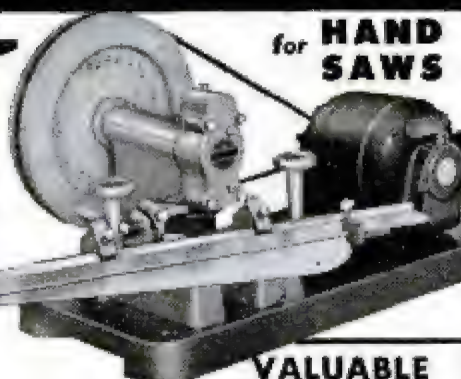
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At the conclusion of the 1948 race Al Rogers was asked if any particular corners gave him trouble. "Yes," the congenial driver replied, "about 165 of them."

Arctic Adventure With a Camera

(Continued from page 129)

can predict how some animals will act, but others are as changeable as a woman. Most animals will turn and run when confronted by man. Just don't count on it. One of them might fool you sometime.

My closest brush with eternity came in Africa and it was my rifle that saved me. I was photographing lions at 20 feet, but it wasn't a big cat that almost got me. Unless a lion is excited, he'll go the other way. It was a Cape buffalo that came charging through the bush, having picked up our scent. Now in my estimation a Cape buffalo is the meanest thing alive. He's not satisfied with bowling a man over. He actually rubs out his enemy with his head. He'll take all day to rub out a man, keeping at his work until there's nothing left except a spot on the ground.

When this particular bull came snorting through the bush, I shot him through the shoulders. It was a mistake I later regretted, for he didn't drop but turned and ran. We crept into the bush after him, determined to finish him off. Finally, we found him and I pumped a second shot into his body; but this too failed to kill him and he disappeared again. We thought we had

(Continued to page 234)

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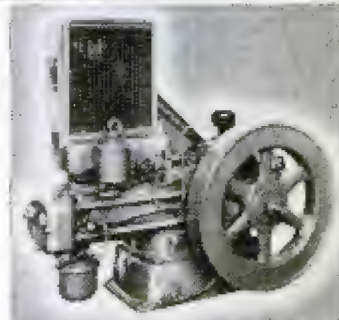
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him cornered, so my companions went one way and I went the other to make sure he wouldn't elude us. I was crawling through the bush on my hands and knees when suddenly I heard him snort. He was no more than 50 feet away and came charging down on me like a locomotive. I jumped to my feet and fired once, hitting him just below the eye, but it failed to drop him. By then he was right on top of me, so close that I could only leap to one side, lift my rifle and fire straight down on top of his neck. That final shot did it. He was an old bull weighing 1800 pounds, each pound packed with muscle and meanness.

In my 30 different expeditions to study wildlife, photograph it, or bring back specimens I've never had such a close call.

I'd like to make one final point. Perhaps you'll think I'm joking when I say that both the Arctic and the jungle are safer than the Chicago Loop during business hours. It's true, though. I'd rather face a family of brown bears than a horde of pedestrians, and a Cape buffalo isn't as dangerous as a "Windy City" taxicab.

Daniel Boones on the Rifle Range

(Continued from page 140)

fundamentals of loading. First, measure out a charge of black powder and pour it

into the muzzle. Then take a piece of linen cloth, wet it with your tongue and place a newly molded lead ball in one corner. Using the short end of a wooden "starter," press the linen-wrapped ball inside the muzzle of the rifle. Cut off the surplus with a sharp knife. Drive the ball well down into the barrel with the long end of the starter. Push it carefully all the rest of the way down with your hickory ramrod. Don't "wham" it and deform the ball.

8. Learn and observe the rules of safety. They're the same as those that apply to any weapon: never point a gun at another person, don't load except while on the firing line and don't drink or smoke when you're handling a gun. In the case of a muzzle-loader, there's an added precaution: don't hurry to reload, because a lingering spark can cause accidents when a fresh charge of powder is put in too soon.

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(Continued to page 236)

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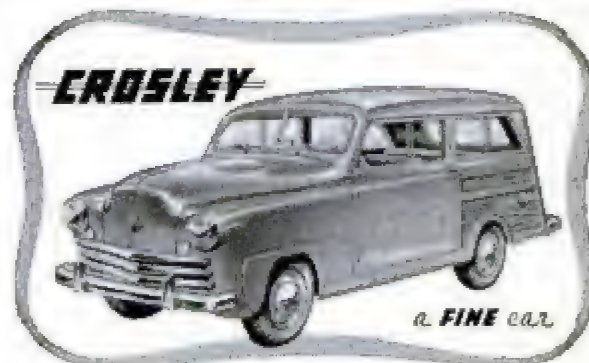


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"I am over six feet tall. I bought the second Crosley ever sold in Baltimore by the Freedom Motor Company," writes Mr. George Kachaylo of Baltimore, Md. "I have since purchased another Crosley for myself and also one for my mother. I have previously owned seven cars but from now on it's Crosley for me!"

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1 gal. can..... 7.25
Postpaid in U. S. A.

Write for free folder: "How To Make Things Last Longer."

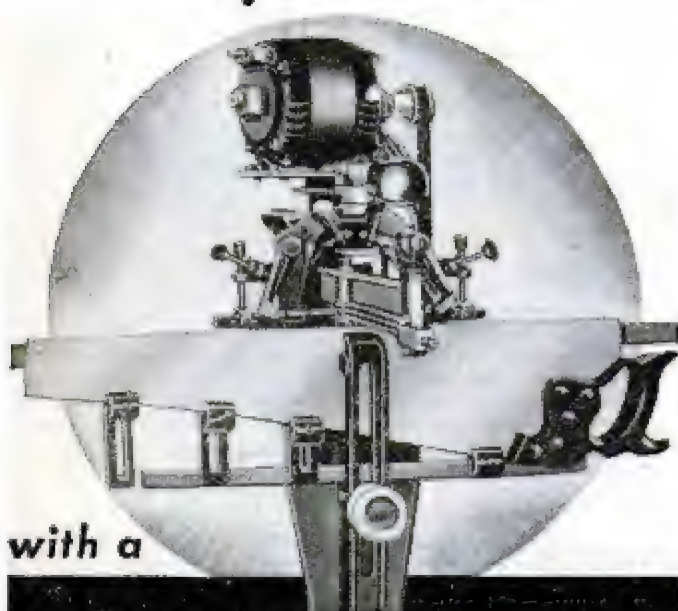
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139 MAGAZINE STREET

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Last Year's Profit \$3,000!



with a

FOLEY *automatic* SAW FILER

"Last year's profit amounted to \$3000. Not so bad for a one-man outfit" — from Charles C. Hough. From Ohio James B. Williams wrote us—"I made \$765 last year filing saws, and it sure comes in handy. I do this work in my spare time." Men in communities of all sizes make up to \$2 or \$3 an hour with the Foley Saw Filer working full time or part time. That extra money comes in mighty handy in these days of rising prices.

It's no trick to take care of the saw filing for your neighborhood hardware or lumber dealer — plus looking after the saws for farmers, townspeople, manual training departments and factories. The Foley files all hand saws, also band and cross-cut circular saws. It's a cash business, no canvassing, no eyestrain and no experience needed.

FREE BOOK

Shows How to Start

INDEPENDENCE AFTER 40 shows just how you can start at home in your spare time — work in your basement or garage. It's an immediate cash business that can develop into a full-time repair shop.



Send For FREE BOOK

FOLEY MFG. CO., 816-9 Foley Bldg.
Minneapolis 18, Minn.

Send me free book "INDEPENDENCE AFTER 40."

Name _____

Address _____

rifle-match shooting: the value of the shot is scored from the center of the bullet hole instead of the edge nearest the bull's eye. This gives no advantage to the chap who is shooting a .48 rifle over one who is using a .30 caliber.

Outdoor ranges of regulation matches are 25, 50, 100 and 200 yards. Two positions are recognized: the offhand (standing) and the bench rest. In the latter position you are allowed to rest your rifle on anything you wish. Theory behind this is that the old-time frontiersmen lay down behind a log and picked off any Indian or redcoat who came into range. As a general rule, the lighter guns are shot from the offhand position, heavier guns from the bench rest.

Interest in muzzle-loading guns builds up all year long toward the national matches in Friendship, Ind. Here the National Muzzle Loading Rifle Association has built the 55-acre Walter Cline Memorial Range as a tribute to one of the founders of the organization. The range includes a fine clubhouse and a 20-acre camping ground which is dotted with the tents and trailers of the shooting brethren during the Labor Day matches.

Shooting a muzzle-loader, however, isn't confined to the target range alone. Many sportsmen use such weapons for game hunting. Deer are the favorite targets, but rabbits, squirrels, woodchucks, opossums, grouse, pheasant and even mountain lions, buffaloes and bears have been bagged.

The special appeal of muzzle-loading guns is the same urge that makes men want to shoot bows and arrows or to seek a 100-pound sailfish on a 6-ounce rod and 9-thread line. With a muzzle-loader, you get one shot at your game—no more.

As one muzzleeer put it: "The modern, high-powered rifle, built with the finest skill and precision, is too coldly scientific. The Kentucky rifle is more of a challenge and more of a sporting proposition."

Another gunbug stated the lure of the muzzle-loader on the range in these terms: "When you're up there on the firing line with a modern rifle, nobody dares talk above a whisper. Everything is grim as death. But those muzzle-loading boys—they chatter like a stump full of chipmunks. You take about 10 minutes between shots, you ask your neighbor how his crops are doing, you laugh at the latest political joke. There's a lot of kidding going on all the time. The guys act human, not like a group of machines."

Muzzle-loading weapons offer two sports and two hobbies — target shooting and hunting, gunsmithing and collecting. Chances are, if you really become interested, you'll be doing a little of all four.

One Swipe of NEW PLASTIC Makes these LEATHER and LEATHERETTE Items LIKE NEW

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Make like new, worn, scuffed or faded leather and artificial leather equipment. Either your own to renew, recolor and beautify, or cafe, restaurant and hotel equipment as a business. Single stroke with a brush renews. Does not crack, peel or scuff. Resists acid, alcohol, caustics and weather. All colors. Mail coupon for free sample.

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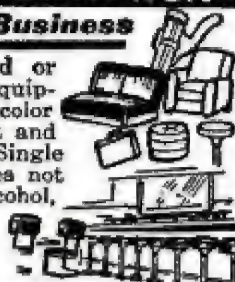
Let me show you how, as I have shown others. Get your own exclusive territory while available. Mail coupon today. I'll do the rest. — Jack Edwards, Sales Mgr.

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Send me without obligation a sample of Leather-New coated material so I can inspect it.

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PULVEX ... KILLS FLEAS
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make your own Gems 29.50
F.O.B.

All necessary lapidary equipment is furnished, including a super-charged diamond blade for sawing, and all wheels for grinding, shaping and polishing also complete instructions. The complete equipment as shown, less motor and belt, for only \$29.50. F.O.B., Burlington, Wisconsin. Write today for information and literature.

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Easy and
Cheap to
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"DU-ALL"**

and "PEPPY PAL" TRACTORS

These rugged walking or riding tractors are ideal for farm, truck garden, orchard, poultry farm. Operate on a few cents an hour. A child can handle them.

DO DOZENS OF JOBS Both riding and walking tractors quickly and easily plow, cultivate, harrow, disk, bulldoze, spray, haul, grind, saw wood, etc.

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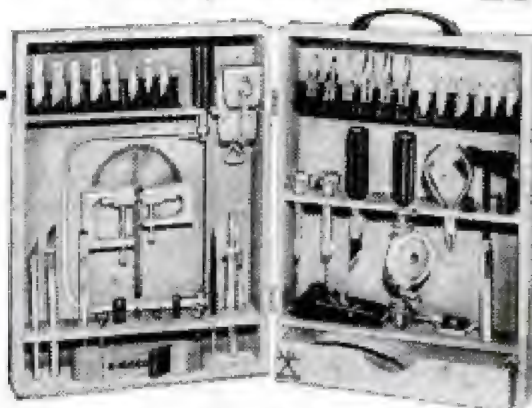
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Complete set of X-acto Hobby Knives \$25
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Every knife, tool and blade in the famous X-acto line. Precision made, easy to handle, joy of amateur and expert hobbycrafters in every field. X-acto knives and tools sell singly and in sets, 50¢ to \$50 at hobby, gift, hardware and department stores. (Prices slightly higher in Canada.)

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X-acto Crescent Prod. Co., Inc., 440—4th Ave., N.Y. 16
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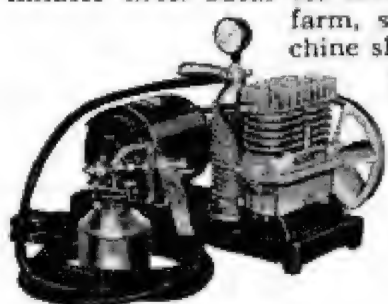
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*Outperforms
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THE only portable air compressor having 4 cylinders in space usually required for one—absolutely no pulsation. Does more painting in an hour than hand brushing in a day. Lubricates machinery, inflates tires. Ideal for home,

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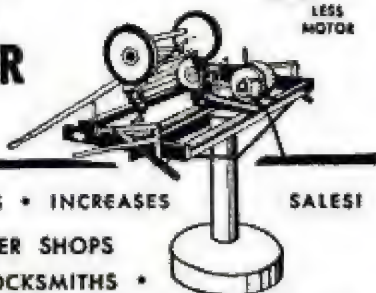
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PROFITS AND SPEED

THE MODERN LAWN MOWER SHARPENER

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\$241.50
LESS
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INCREASES PROFITS • INCREASES SALES!
FOR LAWN MOWER SHOPS
FIXIT SHOPS • LOCKSMITHS •
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*Sharpens All Reel Type Mowers • Hand, Power or
Gang • 10 to 20 Minutes • No Dismantling
No Extra Attachments Needed*

All reel type mowers, from 5-inch edgers to 36-inch power mowers, are quickly sharpened to extreme ends of both left and right twist reel blades. Handle, wheels, roller and motor remain in place when sharpening is in process. Bed knife is sharpened in same brackets that hold mower in grinding position. No extra attachments required. One lever puts mower or bed knife in grinding position. 100% steel construction. Grinding head rides on five ball bearing races. Small, compact, easy to operate. Sharpens wood chisels, joiner knives and planer blades without extra attachments.

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You Can Scream in Safety

(Continued from page 119)

the understanding of how potential customers would react to their dips and curves.

One of these five men is 61-year-old John McKee, superintendent of Palisades Amusement Park in New Jersey, one of the largest in the country. Some 2,000,000 electric light bulbs flashing across the Hudson light the way for thousands of New Yorkers who visit the park every summer. It is the job of John McKee to keep his rides safe. The adverse publicity resulting from one accident can ruin a season's business.

After 43 years of building coasters throughout the United States, in Canada, Italy, France, Germany and England, Mr. McKee has never seen an accident due to mechanical or structural defect. He says quietly, simply, but with emphasis, "If you just sit there, the ride'll take you home." He doesn't hesitate to explain that nearly all the accidents which occur are due to the foolish antics of show-off customers.

There are two main factors besides the various safety devices themselves by which safety on amusement rides is insured: by severe testing and constant inspection. In the same manner that every new jet plane is given a test flight, so is each new amusement-park ride given its test run. In the case of the roller coaster, each car is loaded down to more than three times its normal operating capacity during the trial run.

An ordinary roller coaster represents an investment of \$75,000 to \$150,000, while an entire large park costs millions. The owners are astute businessmen who, in order to protect their investments, employ large crews of welders, carpenters, electricians and mechanics who can be found scurrying over the park inspecting every ride each morning. In the off season, major rebuilding and repairs are undertaken.

Amusement parks, besides constituting a great American holiday pastime, are excellent matchmakers. McKee claims that Palisades Park is responsible for about a dozen marriages each year. One couple, a few years ago, was so indebted to the coaster on which they met that they decided to get married on it. So round and round they went as the preacher, getting paler and paler, pronounced them man and wife.

Probably next to the coaster in popularity of appeal to our masochistic natures is the whip, a suspense-filled little torture device that carries its passengers in a car at a relatively slow speed until it comes to the end of its oval orbit. There it whips the car around the semicircular bend with tremendous speed and jarring suddenness. A

(Continued to page 240)

STOP TAPPET NOISE!

Install ADJUSTABLE TAPPETS

for FORD and MERCURY V-8's (85-100 HP)



Johnson Adjustable Tappets guarantee better engine performance! Nothing complicated... no extra labor involved. Simple and easy to install during valve grinding jobs.

NEW PRICE ONLY 85¢ each

ASK YOUR SERVICE MAN OR NEAREST AUTOMOTIVE JOBBER TODAY

JOHNSON PRODUCTS INC. Muskegon, Michigan



DRAINS CELLARS, WASH TRAYS CIRCULATES OIL

Pumps 1800 GPH 300 gal. 30' high, use 1/4 to 1/2 HP **\$6.50** motor. Will not clog.

Postpaid if cash with order. (Add 50¢ for west of the Mississippi.)

Thousands in use since 1936

LABAWCO PUMPS, BELLE MEAD 7, N. J.

MARCOT KEY MACHINE



MARCOT No. 8 KEY MACHINE, mounted on Cabinet, less motor... \$95.00
Auto Code Book and Depth Keys... 12.50
100 Ds. Popular Key Blanks... 60.00
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How to Open Locks without Keys or Picks; Secret of Locksmithing; How to Make Keys by the Impression Method; Master Key Systems.
TOTAL COST... \$184.75

A. J. MARCOTTE CO., 1200 N. Kedzie Ave., Dept. PM, Chicago 51, Ill.

10 P PORTABLE POWER PLANT from any CAR or TRUCK

Line up with rear wheel, drive on to unit—that's all! Unfailing power where you want it—when you want it! No demounting, no jacking-up! Suitable for any belt-driven, power operation. **NEW, LOW PRICE! ACCESSORIES AVAILABLE:** Generator, Grinder, Centrifugal pump. Illustrated circular on request.

FREE Illustrated Circular

ASPEGREN MFG. CO.
1612-M Webster Ave., N. Y. C. 57



NEW ROCKET

JET PROPULSION. FOR FUN OR EXPERIMENT. Zooms over 200 feet high.

\$2.95

25,000 M. P. H.

Speed a rocket must attain to escape from the earth. Many other facts supplied with full instructions. Special launching stand. Can be used repeatedly. Send \$2.95 we pay postage. Sent C.O.D. for \$3.50.

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FASTEST PLANER in the WORLD at this Low Price... \$195.00

BELSAW Multi-Duty Planer



Speed up production! Increase your profits! BELSAW power self-feeds at 24 feet per minute... The lowest-priced surfacer that will handle 12x6 in. stock. Planes green or dry sawed lumber into smooth, worked forms. Three high-speed steel knives make 42 cuts per inch. Multi-duty BELSAW takes inexpensive attachments for all planing mill operations—Jointing, Rabbering, Grooving, Matching. BELSAW is the **only** 12 in. planer providing **attachments for jointing and grinding its own knives**. Start planning NOW for **BIGGER VALUE and BETTER PERFORMANCE**, with BELSAW. Write for **FREE** specifications, illustrations and low prices.

• LARGER CAPACITY • FASTER OUTPUT • KNIFE SHARPENING ATTACHMENT

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LOW PRICED
Mall Saw

DOES

EVERYTHING

MODEL 60

ONLY

\$61.95

Complete with Bevel-Depth Attachment

SAW ONLY

\$54.95

ATTACHMENT

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All Prices F.O.B. Chicago

6" BLADE—2" CAPACITY

It bevel cuts to 45-degrees, rips, crosscuts, angle cuts, rough or dressed lumber. It grooves mortar joints, cuts metals, cuts and scores tile, concrete and other aggregate compositions. Depth is easily adjusted on straight cuts from 5/16" to 1-31/32"; and from 1/4" to 1-11/32" on 45-degree bevel cuts. When set in a Mall Saw Table, various available attachments equip it as a table saw, face and drum sander, wire brush and shaper. Light-weight rugged construction. Operates from 115-volt AC:DC or 230-volt AC:DC. For 32-volt battery lighting systems without Bevel-Depth attachment \$58.95.

Ask Your Hardware or Power Tool Dealer. **FREE Booklet** "Mall Portable Power Tools" mailed upon request.

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Cracked Water Jacket SEALED TIGHT



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FREE 40-Page Repair Handbook

Shows, besides above repairs, many time-saving, money-saving household uses. Heating and plumbing system leaks stopped. Loose hinges, handles, parts tightened. 170 illustrations. Write for your free copy TODAY.

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Do it with

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THE IRON CEMENT OF 1000 USES

SAY YOU SAW IT IN POPULAR MECHANICS



Smooth Going



After a...



CASITE TREATMENT



- A Pint through the Air Intake
- A Pint in the Crankcase

Tune up your engine with a Casite Treatment. A pint through the air intake quickly frees sticky valves and rings, gives old-time zip and power.

A pint in the crankcase *keeps* your engine clean and free running—speeds up lubrication—retards engine wear and cuts repair bills. That's the Casite Treatment. That's the way to smoother, happier miles.

Get a Casite Treatment today—from any garage, service station or car dealer.

THE CASITE CORPORATION, HASTINGS, MICH.
Casite Division, Hastings Ltd., Toronto

BETTER AND SMOOTHER PERFORMANCE
or Double-Your-Money-Back

one-inch steel cable, which runs around the central platform dragging the cars around also keeps them from yielding to centrifugal force and flying off on a tangent.

The thought of what would happen were this cable to snap is a standard American nightmare which has replaced the bogeyman for sheer terror. One ride on the whip leaves most people with images of their car hurtling through the rail, into crowds, and splashing its occupants like eggs against a wall two miles away.

What most people fail to note in their excitement, however, is that there is another cable, a slack cable, which is passed through an eyebolt on the steel arm leading to each car. This cable is never strained while the ride is in operation and is ready to sustain a load of five tons, more than is necessary to hold the cars in check should the main cable break. All that the occupants would feel would be a slight jolt. This safety cable was first used by John McKee and has since been universally adopted by manufacturers.

The principle of a slack safety cable has been applied to many other rides including the Scooter. Here, cable-supported cars are swung around a circular path several yards above the ground. Besides the supporting cables, several slack cables are strung around each car so that they would support the car only in the event that the main cables broke.

Amusements have come a long way since the days of the tiny Roman merry-go-round to the 200-ton, 150-foot-high Wonder Wheel at New York City's Coney Island. This overgrown Ferris wheel, which would cost \$300,000 to build today, has the novel feature of cars which roll on tracks back and forth from the center to the edge of the wheel as it turns.

New rides come into existence every year. Latest among these are the Gyro and the Hurricane. An idea of how the Gyro works can be obtained by imagining a huge steel gyroscope with people seated along the edge of the spinning wheel, while the outside sphere rolls from side to side through an angle of 60 degrees in each direction as it rotates.

The Hurricane is an octopuslike horror machine which spins around, while the "tentacles" with the cars at their ends move up and down.

Whatever the contraption, no matter how terrifying it is, you can bet your bottom dollar on the fact that it is safe and that it has been tested and is tested daily. For, as one Coney Island amusement-ride operator put it, "the reason they spend money to ride is that they know in their hearts the ride is safe. That's just the gimmick."



Hands Never Touch the Water—Can be put in Boiling Water, Housewives Like It.

48" Long Handle

Sales QUICK, EASY Every Locality

SALES ARE EVERYWHERE . . . Sells quick to Taverns, Clubs, Hotels, Hospitals, Stores, Restaurants, Large and Small Buildings and the Homes . . . Scores can be sold on a single street . . . Note the Drain Bracket in the illustration . . . This squeezes out the water so thoroughly that HANDS NEVER TOUCH THE WATER . . . Makes no difference what you ever sold, you will like this proposition . . . Your name on a Post Card will bring you FREE PARTICULARS.

CELL-U-MOP CO., Dept. P-8, FREEPORT, ILL.

... Quick Easy Way to BIG PROFITS

Read What Others Are DOING!

"Enclosed you will find 56 orders representing 9½ hours' work on Monday and Tuesday."

"Enclosed are twelve orders secured after supper this p.m."

Housewives are Enthusiastic

Everyone that sees this outstanding Cell-U-Mop immediately wants one . . . That's the reason why our distributors are so successful . . . You also have the advantage of our other QUICK SELLING PRODUCTS that step up your Volume Sales and Profits.

• We Teach You How •

Gets down under and around for MOPPING, DUSTING or WASHING

Get Choice Territory NOW!

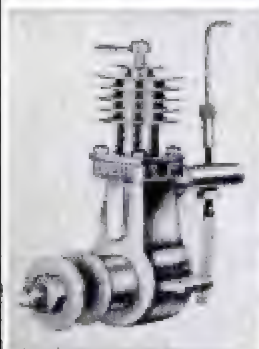
DOES THE WORK OF 6 TOOLS IN 1

Holds 20 times its weight in water.



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\$2.95



WE'RE CRAZY, they tell us, giving away a real diesel engine, complete with cylinder and piston, carburetor, crankshaft and connecting rod. All parts completely machined, ready for easy assembly. **ONLY \$2.95.** How do we do it? We're selling thousands of **DEEZILS**. So production's up; costs tumble down. **DEEZIL** is a precision engine. Actually runs at 7500 RPM. Produces 1/7 HP. Ideal for planes, boats, midget cars. Send \$2.95 plus 25c postage today.

GOTHAM HOBBY CORP.

107 East 126th Street New York 35, N. Y. Dept. "P"



Spray away Starting Troubles

SEND \$1 FOR SPECIAL INTRODUCTORY CAN (REGULAR \$2.35 VALUE)

SHORTSTOP IGNITION SPRAY
ELIMINATES SHORT CIRCUITS IN MOTORS

ZACO LABS • 1360 W. 9th • Cleveland, O.

ORDER DIRECT TODAY!

SAY YOU SAW IT IN POPULAR MECHANICS

ELECTRO BAND SAW BRAZER



FOR RESISTANCE BRAZING OF BAND SAW BLADES

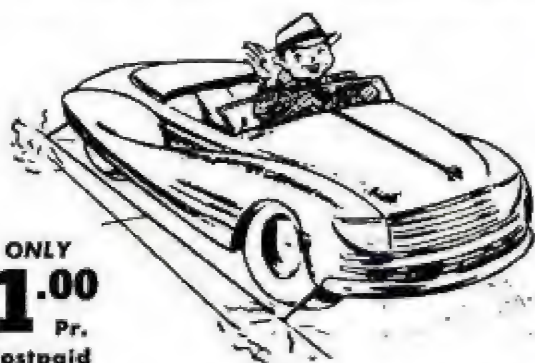
Repairs broken saw blades without delay. Permits savings by making new blades from coil stock. Simplifies inside sawing. Welds up to ½" blade in one operation and up to 1" blade in two operations. Portable. Uses 50 C-60 C, 110 V. Fully guaranteed.

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EASY TO ASSEMBLE KITS

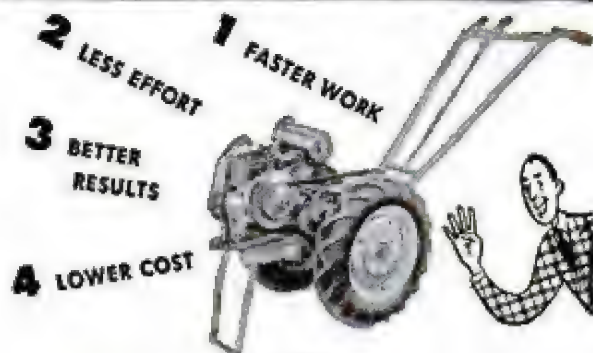
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SEND 25¢ Colorful Illustrations show all 49 Models, 8 to 23 Ft., and (COIN) FOR CATALOGS Construction Details.

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MEASURE PROFIT 4 WAYS



WITH BOLENS HUSKI POWER-HO

It's always ready to do a big job for you... any day of any season. Use it to plow, seed, cultivate, weed, mow lawns, spray, compress air or plow snow in winter. For really efficient work at low cost, you can't make a better buy than the 1½ h.p., variable speed BOLENS HUSKI Power-Ho. See your Bolens dealer or write direct for complete information.

BOLENS HUSKI TRACTORS — the Complete Line From 1 h.p. to 5 h.p.—1 wheel, 2 wheel and 3 wheel models.



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Food Machinery and Chemical Corp.

Better performance, better price... your best buy is BOLENS

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(10% discount on 4 or more tires if you send this ad with order)

**TUBE DELIVERED WITH
TIRE AT NO EXTRA COST**

Safe — Our tires used on school buses and ambulances
All good tires with a

GOLD BOND GUARANTEE FOR 12 MONTHS

550-16	\$3.54	30-5	\$ 7.98	1200-20	\$18.78
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700-16	4.59	700-20 (10)	12.48	1000-22	17.70
550-15	3.79	750-20 (8)	8.19	1100-22	16.89
650-15	3.89	750-20 (10)	9.19	900-24 (40-8)	21.60
700-15	3.98	825-20	11.19	900-16	8.98
550-17	5.60	900-20	11.89	825-15	
750-16	8.40	1000-20	12.89	(14 ply)	14.10
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"A gold band written guarantee with every tire"

How the Atom Is Working for You

(Continued from page 77)

which occurred in the atom bomb. It is the kind of reaction which occurs in a pile. It is from this that energy may be obtained.

In an atomic pile, uranium pieces are arranged in a material known as a moderator. Any pile generates some heat or energy. The big piles at Hanford, Wash., are cooled by water from the Columbia River. As a result, the water is raised in temperature. Several piles are now under construction, however, in which the temperature at which they operate will be high enough to



After severe irradiation, tulip bulbs are checked for radioactivity by Argonne scientist in experiment to learn effect of neutron bombardment on tulip heredity

produce steam; this steam can be used to run a turbine and generate electricity.

A ship powered by atomic energy would become obsolete through normal deterioration long before the amount of uranium consumed exceeded that which could be stored in the captain's cabin, shielded, of course, by thick lead walls. The energy available from a pound of uranium is equal to that of three million pounds of coal.

There is one interesting prospect now under investigation. The part of uranium which is fissionable is U-235, but, when neutrons hit U-238, which is much more common, the result is to change some of the U-238 into plutonium. Plutonium acts like U-235; that is, it is easily fissionable. This means, therefore, that as the U-235 is being used up, it is producing plutonium. It is

(Continued to page 244)

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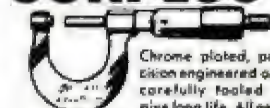
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almost as though the coal we burn produced ashes which themselves were as good as coal. This is known as the breeder principle because the uranium can be made to breed plutonium which is, in itself, good fissionable material.

The energy possibilities are very great and very dramatic. It is because of the tremendous energy, that the atom bomb is in an entirely different class from ordinary chemical explosives like T.N.T. It is because the energy of matter is so great that it becomes possible to think of running airplanes, ships, automobiles and railroads with fuel that would be built in and would never have to be replenished. But I would not want anyone to think this is just around the corner. There are many serious problems in putting this energy to work on an economical basis.

I should like now to tell of another application of atomic research. You have heard about isotopes. Two isotopes are forms of the same element differing in the number of neutrons in the nucleus. For example, heavy hydrogen is an isotope of ordinary hydrogen. The two isotopes behave chemically in exactly the same way. Therefore, wherever ordinary hydrogen is used it would be possible to use heavy hydrogen. Some isotopes are radioactive; that is, they are giving off radiant energy because the nucleus is unstable. These isotopes provide a means of tracing chemical reactions.

For example, it is possible to put a radioactive isotope of sulphur into the coal and coke used in a blast furnace. This can be done in such a way that when the iron comes out, with a certain amount of sulphur in it, you can tell whether the sulphur came from the coal or from the iron ore, simply by finding out whether the iron is radioactive. This knowledge is very important for blast-furnace operation.

For medical work, the tracers are also important. It is possible, for example, to put a pinch of radioactive metal into the diet and to find out where the metal goes in the body. One tenth of a gram can be spread over the diet of one million rats and every one of them will be radioactive. A little bit goes a long way.

You have heard of digitalis. It is a wonderful drug for stimulating the heart. Many people have been kept alive with it for long periods. It is made from the root of the foxglove. But, while doctors have been using it for many years, they haven't known just how it worked—whether it went into heart muscles, heart nerves or into blood vessels. But now it is possible to grow the foxglove plant in an atmosphere in which the carbon dioxide, necessary to plant growth, is made

(Continued to page 246)



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of radioactive carbon. The plant then carries the radioactive carbon into the root and when the digitalis is extracted it has radioactive carbon in it. When this digitalis is fed to the patient, it becomes possible to trace the course of it through the body and find out what parts of the heart system are affected by it.

At the University of Chicago, we have a little farm where we are growing many kinds of plants—foxglove for digitalis, poppies for morphine, etc.—in radioactive carbon dioxide. By this method we are beginning to find out how many important drugs really work.

One interesting result of this isotope research was found when some radioactive table salt was fed to people. All of us had supposed that salt went through the body fairly slowly but, as a matter of fact, within one minute after radioactive salt was eaten, the perspiration coming out of the pores was found to be radioactive.

Isotopes are being used in over 1000 research projects. They are helping us learn how fertilizer makes things grow. It has been known for a long while that only a small part of the fertilizer actually goes into the plant. Now we are beginning to find out why this is so by using isotopes of nitrogen, phosphorus, sulphur, calcium, iron and many other elements in order to learn just what part of the fertilizer is really doing the work. The effect that this may have ultimately on farming may be most dramatic. It is of particular interest, of course, in view of the reports we hear that the population of the world is out-stripping its ability to produce food.

But, one of the most interesting ideas that comes from atomic research is in the effect that radiation has on living things. When you stop to reflect, you have to recognize that all energy on earth has been coming from the nuclear reaction taking place on the sun. Every plant that has ever grown, including those which have gone into the making of petroleum and coal, derived its growth from energy from the sun.

The new availability of radiation from man-made nuclear reactions may open up new patterns of growth. For example, we know that radiation has an effect on living cells. By shooting radiations at seeds, it is possible to produce a great variety of weird and unusual sports or freaks. Most of them are useless, but some may be very useful. I have been told, for example, that by this means a pineapple plant has been produced which yields pineapples many times the volume of ordinary pineapples.

Much work is going on to learn how the different kinds of radiations may affect

(Continued to page 248)

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Send me.....tool kits.

☐ \$ 9.95 Kit

☐ 14.95 Kit

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☐ Enclosed find check or M.O.

☐ Ship C.O.D. I will pay post.

Name.....

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King Midget



- HOME ASSEMBLED
- MASS PRODUCED
- LOW-COST AUTOMOBILE

Drive this car for as low as \$100 per week, tip to 10 miles per gallon, 45 to 50 m.p.h. Large enough for a husky six footer. A pleasure to assemble. Just bolt together our precision built parts. Get the facts. Send 25c for detailed circular with large photo, 4 view drawings, price of all parts. Better still, send \$1 (refunded first order) for this plus actual assembly book with 42 photos, drawings: blueprints of snow and ice conversions, etc.

WORLD'S LOWEST PRICED CAR

MIDGET MOTORS MFG. CO., Athens 1, Ohio

A TOOL... NOT A BRUSH

\$1.00 POST PAID

PAINTERS' STRIPING TOOL

NOW! PAINT STRIPING MADE EASY!

Easy to use as a pencil! Draws parallel lines, straight, curves, circles with paint, enamel, lacquer, etc. Do your own striping on autos, furniture, toys, bikes, model planes, signs, linoleum... make wall board look like tile. Painters - craftsmen, order today! Type "M" Master Painters' Striping Tool complete with tip for 1/16" stripe, \$1.00. Tool with choice of 1/64", 1/32", 3/64", 5/64", 3/32", 1/8" tip—\$1.50... all tips 75c ea. Tool with complete set of 7 tips \$5.00. (C.O.D.'s postage collect.) Dealers write:

WENDELL MFG. CO.
4234-B Lincoln Ave., Chicago 18, Illinois

EARN BIG MONEY AND BE YOUR OWN BOSS Sharpening Lawn Mowers

Build a Business of Your Own With A UNIVERSAL GRINDER

In your own garage or basement, and earn \$25.00 a day or more. Mr. Hardy writes, "I am doing a fine business with the UNIVERSAL GRINDER. One customer sends another. I spent 40c for a newspaper ad and have done nearly \$500.00 worth of business." Mr. Helmeck of Canada writes, "We sharpened 750 mowers last year and are 1050 on this years run. The Universal surely makes customers." Mr. Barton of California says, "The mower business, with the Universal Grinder, has been a gold mine these last two years."



Only on the UNIVERSAL GRINDER can the inside face and edge of the stationary blade, as well as the reel blades, be ground to proper clearance ALL IN ONE SET-UP without removing any blade from the mower.

WRITE FOR FREE FOLDER TODAY!

ROGERS MFG. CO., Dept. M-89, Lindsey, Ohio

cancerous growths. It has even been suggested that the aging processes, the reason why plants and animals and people grow old, may be found in the free radiation of cosmic rays. There is even the dim possibility that we may open up the shocking problem of letting people live without growing old. Imagine how you'd feel if you could stay at the age of 22 forever—subject only to the avoidance of automobile accidents or war—and imagine what a mess the world would be in!

There is no question that atomic research is opening up the greatest economic facts since the discovery of fire—and all of them are based upon a chain of ideas which is still being forged.

Ideas beget ideas. Michelson inspired Einstein. Einstein suggested something to Rutherford and Rutherford to Fermi. Back and forth in an endless criss-cross the ideas bound. Thus the chain reaction of knowledge proceeds.

To have ideas, we must have freedom. It is for this reason that freedom in universities, the so-called academic freedom, is important. It is not because it is important to the universities—it is not because it is important to the students, professors or scientists—it is because it is important for you and me.

Freedom of ideas produced the atom bomb. But the atom bomb is not our greatest weapon. Our greatest weapon is freedom itself.

War Horses Still Fight Out the Air Derby

(Continued from page 100)

the Bendix on two occasions and has established an international record of 469.349 miles per hour for the 100-kilometer closed course. (This flight was performed at high altitude and is not to be compared with the Thompson type of closed-course flying.) Another P-51, owned by movie-actor Jimmy Stewart and flown by Joe DeBona, has figured in recent transcontinental records.

To date the P-51 has been unbeatable in long-range, high-altitude flying and we may expect it to remain at the top in the Bendix. But, although these ships will probably be numerous in the Thompson again this year, their likelihood of winning is apt to depend upon the failure of several other ships that are better suited to the pylons circuit.

The Lockheed Lightning had been expected to show real class in the cross-country contests, but it has sadly disappointed its proponents in the Bendix. On the other

(Continued to page 252)

ARC WELDING

FOR PROFIT OR PLEASURE

60 LBS. OF READY MADE PARTS

BUILD YOUR OWN HEAVY DUTY WELDER

All parts Ready-Made and easy to assemble. You can do all around welding on steel, cast iron and other metals after only a few hours practice. Illustrated instruction manual included. Sold on 30-Day Money-Back Guarantee!

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1037 So. 19th St. OMAHA, NEBR.

SAVE
Buy Only NECESSARY PARTS



Gives 100% penetration. Welds are stronger than original metal. Operates on 110 or 220 AC.

RUPTURED?

Get Relief This Proven Way

Why try to worry along with trusses that gouge your flesh—press heavily on hips and spine—enlarge opening—fail to hold rupture? You need the Cluthe. No leg-straps or cutting belts. Automatic adjustable pad holds at real opening—follows every body movement with instant increased support in case of strain. Can not slip whether at work or play. Light. Waterproof. Can be worn in bath. Send for amazing FREE book, "Advice To Ruptured," and details of liberal truthful 60-day trial offer. Also endorsements from grateful users in your neighborhood. Write:

CLUTHE SONS, Dept. 31, Bloomfield, New Jersey

Pistons

ALUMINUM ALLOY. For Auto, Truck, Tractor, Motorcycle, Scooter, Outboard, Marine, Compressor, Industrial Engines. **EVERY MAKE, ANY YEAR,** odd or foreign. Send sample or specifications.
JUDSON MFG. CO., 4527 Hedge St., Phila. 24, Pa.

\$10,000 REWARD

Earn the government bonus by locating Radio-Active Ores with the

P.R.I. GEIGER COUNTER

Weight about 2 lbs. Price only \$75.00 complete. The most sensitive portable Geiger counter made.

PRECISION RADIATION INSTRUMENTS, INC.
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Dealer Inquiries Invited

SAY YOU SAW IT IN POPULAR MECHANICS

LAWNMOWER SHARPENER OPERATORS

Increase your output... Year 'round business!

NEW BED KNIFE GRINDER

sharpens all STRAIGHT EDGE TOOLS

Model 50 Ideal Bench Grinder doubles your output of sharpening jobs, speedily grinds straight blade knives. Sharpens all kinds of straight edge tools and ice skates. Write for FREE, fact-filled folder.

THE FATE-ROOT-HEATH COMPANY
Dept. D-3, Plymouth, Ohio

AMAZINGLY LOW PRICED CASCO Power Tool KITS

With a Casco Power Tool Kit, every job is a better job! For the finest equipment at any price is right at your fingertips. And the cost is so very low, it quickly pays for itself. A "must" for every craftsman, hobbyist, builder and repairman!



for WOOD, METAL, PLASTICS, FIBRE, GLASS, LEATHER...

It drills! It polishes!
It saws! It etches!
It carves! It grinds!
It sands! It buffs!
It sharpens! It cuts!



CASCO ELECTROMATIC
(What a Gift!) ONLY \$19.95
50-pc. set

CASCO TOOL 'N' RAK
hangs up where you work! \$17.95
40 pieces, ONLY



GET YOURS NOW at Department, Hardware, Auto Supply, Appliance and Jewelry stores.

CASCO CASCO Products Corp.
Bridgeport 2, Conn.



BUILD FINE GRANDFATHER CLOCK NOW

The simple sensible Red-i-Kut way as thousands have—SAVE HALF. SHOP TESTED PLANS "SPIRIT OF THE CENTURY" Narrow waist 8 1/2" tall or stately "SPIRIT OF AMERICA" straight side model with pictures. EASY-TO-FOLLOW PLANS tell all—plus BROCHURE of heavy brass weight Westminster, tube chime, movements, dials, solid mahogany case kits. Send \$1.00 today—Both Plans \$1.50 NOW. **KUEMPEL CHIME CLOCK CO., #4 Kuempel Bldg., Minneapolis 16, Minn.**

TUBE GIVEN WITH EVERY TIRE



Why Pay More?

EVERYONE TAKE 10% DISCOUNT ON ALL TIRES

OUR Tires must make good or **WE WILL** If You Want **SAFE TIRES**
Be Wise—See Us Before You Buy
Our Experience Insures Your Safety
You get what we advertise
Highest Quality Lowest Prices
HIGH ORIGINAL TREADS Slightly Used
BUY IN CONFIDENCE safe dependable selected **POPULAR BRANDS**—Guaranteed to give **A-1 SERVICE**. These tires are absolutely **NOT Re-caps or Re-molds**.
NEEDLESS TO PAY MORE RISKY TO PAY LESS

SELECTED for TOUGHEST JOBS Not just good... **THE BEST** These are genuine Values! One Trial will CONVINCE YOU

TOPS IN VALUE		TOPS IN SAFETY	
600-16	\$5.02	650-16	\$4.72
650-15	4.72	700-15	5.02

World's Best Truck Tire Values		Top Service Minimum Prices	
6.00-20(6)	\$9.22	7.50-20(10)	\$13.92
8.50-20(6)	9.22	8.25-20(10)	15.52
7.00-20(8)	10.52	9.00-20(10)	15.52
7.50-20(8)	10.52	10.00-20(12)	16.22

750-20 MILITARY 8 PLY REGULAR	\$9.62	SUPER	\$12.92
900-16 MILITARY 8 PLY REGULAR	\$8.72	SUPER	\$10.92

ONE QUALITY THE BEST AVAILABLE

HERE'S MAXIMUM QUALITY IN THESE O.K. SAFE TIRES			
600-16	\$3.42	650-16	\$3.62
650-15	3.62	700-15	3.72
6.00-20(6)	\$7.72	7.50-20(10)	9.02
6.50-20(6)	7.52	8.25-20(10)	11.02
7.00-20(8)	9.02	9.00-20(10)	11.62
7.50-20(8)	8.02	10.00-20(12)	12.22

OUR SPECIALTY—TIRES FOR SCHOOL BUSES AND AMBULANCES

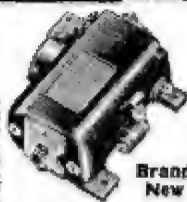
Thousands of Tires Shipped to Satisfied Customers Throughout United States and Many Distant Points. Please Note: We've made Thousands of Friends by giving a Tube with Passenger and Truck Tires. MAIL ORDERS given Personal Attention—Send This Ad with Check or Money Order. Dept. 2

STANDARD 834 N. Broad St., Philadelphia 30, Pa.

2 Pages of GROBAN'S WAR SURPLUS Specials!

MINIATURE High Speed ELECTRIC MOTOR

IDEAL FOR MODEL BUILDERS, MODEL RAILROADERS, EXPERIMENTERS, HOBBYISTS, AC or DC. Reversible, speed may be regulated by varying voltage. Has miniature Nixon thermostatic switch. All connections are external and accessible. Has 3 mounting feet for easy installation. Double-end ball bearing supported shaft with small gear on one end. Die-cast housing with laminated field. Overall Dimen.: 3 1/4" long x 2 3/8" wide x 1 3/8" high. Net wt. 12 oz. A \$22.00 value. (ITEM #5)



Brand New \$2.95 post-paid

SPECIAL! HANNA AIR CYLINDER

Brand New Used for heavy duty industrial applications on shop air lines or with low pressure systems. With 100 lbs. of air pressure will deliver 1900 lbs. pressure at the ram shaft. All steel construction. Adjustable cushions at both ends of cylinder. Shaft dia. 1 1/2". Foot mounting with clevis on ram shaft. 2 3/4" double-acting stroke; 5" bore. 40 1/2" overall length closed, 7" overall width. 89 1/2 lbs. net wt. Gov't. acq. cost \$101.85.

AN EXCELLENT VALUE for . . . \$39.50

(ITEM #61) F.O.B. Chicago

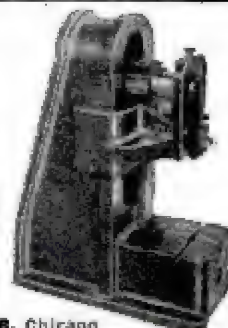
Brand New PNEUMATIC COMPRESSION RIVETER

MODEL CP 625-T8112

Made by Chicago Pneumatic Tool Co. Equipped with built-in control valves for use with cable operated remote control. Has 6" dia. actuating cylinder with right angle head. Base is 27 1/2" x 4". Height 40". Ram assembly adjustable for height. Approx. wt. 1300 lbs. A \$1200.00 value. (ITEM #62) . . . Now

\$169.50

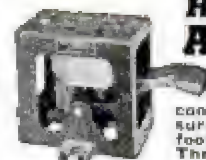
F.O.B. Chicago



ROSS 4-Way Foot Operated AIR VALVE Model 398

BRAND NEW. For double-acting pneumatic devices. Fine for operating presses, air vices, air machinery of many types. Heavy duty cast construction. No neutral position. Maintains pressure against the piston when the foot control is in the "Up" position. Threaded for 1/2" pipe. Dimensions of valve body: 7 3/4" L x 4 1/4" W x 7 1/4" H. Net wt. 28 lbs. A \$64.00 value for only . . . \$19.50

F.O.B. Chicago



(ITEM #60)

LOGAN 4-Way Foot Operated AIR VALVE—Model 6520

BRAND NEW. For double acting pneumatic devices. Fine for operating air vices, presses, air machinery of many types. Heavy cast construction. Threaded for 1/2" pipe. Dimensions of valve body: 8 1/2" L x 5 3/4" W x 7 1/2" H. Net Wt. 28 lbs. Gov't. acquisition cost \$42.00. AN OUTSTANDING BUY AT . . . \$15.00

F.O.B. Chicago



CENTRIFUGAL PUMP BELT DRIVEN

Ready for use on any Liquid Pumping Need Use it for DRAINING BASEMENTS

- HOME WATER SYSTEMS
- IRRIGATION
- STOCK WATERING
- FIRE PROTECTION
- DRAINING PONDS, TANKS, etc.
- INDUSTRIAL PUMPING

Complete with Pulley and Mounting Bracket—Ready for Use

\$29.75

F.O.B. Chicago

A super value for all types of intermittent service in pumping large volumes of liquid in home, farm and industrial service. Ideal for home water systems, draining basements, fire protection, etc. On the farm for watering stock, draining ponds, sprinkling, etc. In shops and factories for all types of pumping service.

MOVE LARGE VOLUME QUICKLY When operated at 1750 RPM, will pump 42 gallons per minute on a 25 foot head; at 3600 RPM on 52 foot head will pump 88 gallons per minute. May be run with electric motor, gas engine or power take-off on tractor.

COMPLETE ENGINEERING REPORTS AND OPERATING INSTRUCTIONS FREE WITH PUMP

Pump has cast aluminum housing—accurately machined bronze impeller vanes. Complete with mounting bracket and 3/4" V belt pulley. Shaft rotates on sealed ball bearings with grease gun fitting. Has 1 1/2" threaded intake flange, two 1 inch outlets. Use one or both, as necessary. Made for Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft engines.

GREATEST PUMP VALUE IN YEARS Shipping weight 25 lbs. You can't beat this value at anywhere near this price. Satisfaction guaranteed. Original Cost Approx. \$147.00. (ITEM #64)



Brand New

SPECIAL AUGUST BUYS!

BRAND NEW 3-IN-ONE GEAR PUMP

Three independent gear pump sections running off of one shaft; for single or multiple pumping. Has pipe thread connections. Shipping wt. 10 lbs. (ITEM #14) F.O.B. Chicago \$9.95

AIR FORCE WOOD PROPELLER

BRAND NEW—Made of polished laminated hard wood, 90 inches long, shpg. wt. 75 lbs. (ITEM #30) F.O.B. Chicago \$9.75

BRAND NEW GENERAL ELECTRIC 8" SEALED BEAM FLOODLIGHTS 300 Watts, 110 Volts, A.C. - D.C.

Has countless uses for: • Homes • Garages • Workshops • Driveways • Outdoor advertising • Displays • Beach lighting • Private air ports • Photography • Wherever you need flood-lighting! Bought by the U. S. Army for signal use. This is the greatest surplus bargain ever offered. Lens, reflector and electrode vacuum sealed in one dustproof, air tight unit. 300 Watts, 110 Volts. Weighs only 2 1/2 lbs. List price \$10.50. A TREMENDOUS VALUE for . . . \$2.75



EA. POSTPAID

(ITEM #8) 12 or more \$2.50 ea. postpaid

BRAND NEW

Hale Fire and Irrigation High Volume CENTRIFUGAL PUMP

For Fire Protection, Irrigation, De-Watering, Industrial Uses, Farm Uses, Etc. Pumps Rated 500 Gallons Per Minute at 275 Ft. Head Pressure



Equipped with 1 1/2" diameter straight splined shaft for direct coupling drive; 4 1/2" threaded suction intake; two—2 1/2" threaded discharge outlets; Hale Pump Co. Model CF volute type; use any 4 or 6 cylinder gas engine or couple directly to front of truck or auto; or use 25 H.P. electric motor; dimensions 21" x 24" x 28". Complete with full accessory kit including suction and pressure gauges, priming equipment, and instruction book. Ship. wt. 415 lbs. GOV'T ACQUISITION COST \$425.00 (ITEM #48) F.O.B. Chicago

NOW \$149.50

SCREW JACK

Ideal for raising, lowering, leveling and adjusting. Use on tables, machine tools, toys, etc. Overall length closed 9 inches, open 14 inches. Worm gear box with 54 to 1 reduction, with double end drive shaft. Use either end or both. Extension screw shaft 30 to 1 reduction. \$35.00 value. AN OUTSTANDING BUY. (ITEM #48) . . . \$3.95



Brand New

\$3.95

postpaid

SHOCK ABSORBER

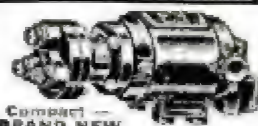
Use them to spring suspend vehicles, hoists, pumps, heavy and light machinery, compressors, etc. 1 1/2" x 2" dia. Welded steel construction for extra strength—U. S. Air Force bought them for bomber gas tank shock absorbers. Rated 2500 lb. Ship. wt. of 4—11 lbs. Each . . . \$1.50 FOR CHICAGO. 4 for \$5.00

FOR CHICAGO

Self-Priming

ELECTRIC PUMP

APPLICATIONS: oil burners, aquariums, fluid metering, fuel pumps, test, post grinder, coolant pump, pressure lubricating pump, general industrial, etc. BRAND NEW MOTOR MFD. BY BLACK & DECKER: double ball bearing series wound, continuous duty, 1/30 H.P. electric motor, rated 12,000 R.P.M. Transformer included for use on 110 V AC current. Also applicable for 24-32 V DC. PUMP MFD. BY WELDON TOOL CO. with standard 1/4" tubing ports; rated 2 G.P.M.; remove pump and use motor as high speed grinder. OVERALL DIMENSIONS: 7 3/4" long x 3 1/4" wide x 3 1/4" high. Approx. wt. 5 lbs. \$51.00 value. (ITEM #1)



\$12.95

postpaid

Brand New Gear Type INSECTICIDE PUMP

All Manganese Bronze for spraying D.O.T., 2-40, Sulphur Compounds, Etc. Pressures up to 150 lbs. to 14 gallons per minute—1500 RPM. Will not rust, pit, foul or freeze up. Use rubber hose inlet, pipe or tubing outlet. Equipped with 1/2" standard pipe thread port. Wt. 14 lbs. Dimen.: 8" x 5" x 6 1/2". Standard 1" manganese bronze shaft with keyway. U.S. Gov't. Acquisition Cost \$62.00 . . . NOW ONLY \$15.00

(ITEM #50) F.O.B. Chicago

GENERAL ELECTRIC DC GENERATOR

For Farm—Home—Factory Welding—Light Plants

Delivers 30 volts, 267 amps, at 4000 RPM. Rated 8 Kilowatts, ball-bearing supported. Fan cooled armature. Drive it off of farm tractor, gas engine of 10 H.P. or more. Ship. wt. 85 lbs. U. S. Government acquisition cost—\$277.00. \$28.50 F.O.B. Chicago



(ITEM #51)

ORDER DIRECT FROM AD
Send payment or purchase order today
SATISFACTION GUARANTEED

Brand New Air or Oil HYDRAULICS



Use hydraulics on arbor presses, hydraulic presses, hay lifts, manure loaders, lift trucks—push or pull, tilt or turn, press or squeeze, open or close, lift or lower—and other hydraulic and industrial applications. Use with either air or oil . . . of finest precision workmanship.

ITEM #4—Double action, 1" bore, 3" stroke, will lift 770 lbs. in 1/10 of a second using Logan Pump. All steel barrel. Ideal for controls, door openers, positioning, etc. **\$4.95**

At \$18.00 value **postpaid**
ITEM #33—Double action, 1 1/2" bore, 5" stroke, will lift 1760 lbs. in one second with Logan Pump. **\$8.95**

At \$35.00 value **postpaid**
ITEM #32—Double action, 1 1/2" bore, 9" stroke, will lift 1760 lbs. in one second with Logan Pump. **\$10.95**

At \$45.00 value **postpaid**
ITEM #16—Use these cylinders on farm trucks, bulldozers, hay lifts, manure loaders, etc. Double action, 1 1/2" bore, 27" stroke, will lift 1760 lbs. in 2 seconds with Logan Pump. Wt. 8 lbs. A \$55.00 hydraulic cylinder value for **\$12.95**

only **postpaid**
ITEM #17—Double action, 2 3/4" bore, 8" stroke. (Will lift 4400 lbs. in one second with Logan Pump). Will withstand 1500 P.S.I. against wall. Wt. 7 lbs. **\$14.50**

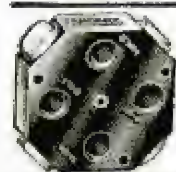
At \$65.00 value **postpaid**
ITEM #20—Double action 2 3/4" bore, 4" stroke, two-way solid 5/8" alloy steel shaft (will lift 4400 lbs. in one second with Logan Pump). A \$73.00 value. **\$16.50**

At \$78.00 value **postpaid**
ITEM #15—Double action, 3" bore, 8 1/2" stroke. All steel hydraulic cylinder, will lift up to 12,000 lbs. (7000 lbs. in 3 seconds with Logan Pump). Complete with fittings. Wt. 12 lbs. **\$19.50**

At \$78.00 value **postpaid**
ITEM #31—Double action, 3 1/2" bore, 11" stroke. (Will lift 9600 lbs. in 7 seconds using Logan Pump.) Complete with fittings. Wt. 15 lbs. A \$92.00 value. **\$22.50**

At \$92.00 value **postpaid**
ITEM #6—Double action, 3" bore, 23" stroke, hydraulic cylinder will lift 7070 lbs. in 5 1/2 seconds using Logan Hydraulic Pump. Especially suited for farm and construction machinery. Clevis mounting for easy use. Wt. 22 lbs. A \$145.00 value. **\$27.50**

F.O.B. Chicago **postpaid**
HI-PRESSURE FITTINGS for cylinders and valves available at 35c ea. for 3/8" pipe and 50c ea. for 1/2" pipe.



Hydraulic Control Valves Brand New

ITEM #24—Four way control valve for use with double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic system to open and close hydraulic cylinders. Brand new. Ship. **\$7.95**

At \$38.00 value **postpaid**
ITEM #26—Four-way control valve for use with two hydraulic double action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. **\$10.95**

Brand New. Ship. Wt. 6 lbs. A \$60.00 value. **\$14.95**

ITEM #28—A two cylinder double action valve with a unique arrangement, allowing the operator to raise both cylinders simultaneously, to lower them simultaneously or to raise one and lower the other at any predetermined rate and speed. Brand New. Ship. Wt. 8 lbs. **\$14.95**

At \$75.00 value **postpaid**

Brand New Logan Double-Action Pneumatic — Hydraulic PRESS

**\$300.00 value
offered at a
fraction of
original cost**

Using air or oil, this device is ideal as a punch press, vise, arbor press, etc. An excellent tool for industrial and shop use. Use 150 lbs. of air pressure or 250 lbs. of oil pressure. Cushioned double action "Logan" Model AC ram, 6" bore and 9" stroke. Capable of up to 4200 lbs. of pressure using air. Has 3" throat. Lubricated gears provide perfect alignment. Has adjustable work space. Hardened alloy steel piston rod 1" diameter. Frame constructed of cast steel with 3/4" base plate. Manufactured by Sipp-Eastwood Co. Unit is 49" high. Base is 9 1/2" wide by 18" deep. Wt. approx. 300 lbs. AN OUTSTANDING BUY at **\$79.50**

(ITEM #7) F.O.B. Chicago



Brand New 18" Wire Spoke WHEEL

For use on motorcycle or adaptable for midget cars, trailers, small trucks, any wheeled vehicle. With bearing races and gear. **\$3.95**

A REAL VALUE at **\$3.95**

(ITEM #57) F.O.B. Chicago

BRAND NEW FIN-COOLED HIGH PRESSURE AIR COMPRESSOR

For pneumatic tools, filling hi-pressure vessels, paint spraying, insecticide vaporizing and other uses. Rated 450 P.S.I. at 1200 R.P.M. Used on Packard Merlin Engine, this aluminum air pump with air filter intake weighs only 4 1/2 lbs. 9" x 5" x 3 1/2". Gov't. Acq. Cost \$183.00. **\$15.00**

(ITEM #56) **postpaid**



GROBAN SUPPLY CO.

1507 SOUTH MICHIGAN AVE.

Chicago 5, Ill. Dept. PM-8

SHOP BY MAIL
and SAVE at GROBAN'S
Buy direct from ad!

Logan Heavy Duty Oil HYDRAULIC PUMP

BRAND NEW . . . for operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 8 GPM at 1200 RPM at 1000 P.S.I. using 5 H.P. Has 1 1/2" pipe thread inlet, 3/8" pipe thread outlet, 3/4" shaft with flat and key-way for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5 1/2" H x 5 1/2" W. A \$105.00 value. FOR ONLY **\$22.50**



F.O.B. Chicago (ITEM #29)



LOGAN Heavy Duty Oil HYDRAULIC CONTROL VALVE

BRAND NEW control valve with built-in adjustable relief valve, will operate one double-acting hydraulic cylinder or two cylinders as one or a reversible hydraulic motor. Valve handle latches in neutral position. Made of rugged cast aluminum alloy. Open center unloads the pump in neutral position. Throttling control allows operator to regulate the speed of movement of the hydraulic cylinder or motor. Has removable mounting brackets with 4 bolt holes, 3/8" pipe thread connections. Overall dimen.: 12 1/2" H x 8 1/2" D x 3" W. Ship. Wt. 17 lbs. Gov't. Acquisition Cost over \$100.00. **\$21.95**

(ITEM #37) AN EXCELLENT BUY FOR F.O.B. Chicago

G-1 STAINLESS TANK

Use these tanks on compressors, for tire inflators, pulsation chambers, floats, buoys, hydraulic reservoirs, fluid and milk containers, fuel containers, etc.



Tough, light. 450 lbs. P.S.I. Aviators Breathing Oxygen bottles, type G1. 2100 cu. in. (approx. 9 gallons) int. vol. 24" x 12", 1/4" threaded openings at end. Wt. 19 lbs. .051" thick. (ITEM #63) Price: F.O.B. Chicago **\$4.95**



Hydraulic Pressure Gauge

BRAND NEW
Ideal for high pressure hydraulic systems, adjusting pressure, relief valves, etc.

Range 0 to 2000 P.S.I. Black plastic case 2 3/4" square, 1 3/4" deep. Black instrument face with white pointer and numerals. Worth many times this low price of **\$2.95**

(ITEM #35) **postpaid**

HAND HYDRAULIC PUMP Brand New

Used for hydraulic jacks, presses, hoists and other hydraulic applications. For operating hydraulic cylinders to pump oil or hydraulic fluid under pressure. Hand pump has built-in check valve and is capable of delivering 1000 lbs. of pressure. Has alloy aluminum housing. Dimen.: 8" long x 3 1/2" high x 2 3/4" wide. Ship. wt. 3 lbs. A \$45.00 value. (Item #11) Now **\$8.95**



Vickers MF9 Hydraulic PUMP or MOTOR

complete with mounting kit ready to install



\$75.00 value

\$19.90

Pump is compact, powerful, rated 1,000 P.S.I., .507 cu. in. per revolution, 8 gal. per min. at 3750 RPM. Change rotation by reversing flow. Delivers up to 6 H.P. Requires 1/3 to 6 H.P. to drive directly or by pulley. BRAND NEW.

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hand, this big twin-engine P-38 could hardly be expected to do well in closed-course racing. Yet Tony LeVier made an excellent showing in such a ship in both the '46 and '47 Thompson Trophy Races. LeVier, however, evidently has gotten the ultimate in speed out of the Lightning and he has been the only pilot to make a good showing in the twin-tail airplane.

It is an air-cooled shipboard fighter that has been the hottest thing to date in pylon racing. The present Thompson record of 396.131 miles per hour was established in 1947 by Cook Cleland flying a Goodyear Corsair. Known to the Navy as the F-2-G, the big Corsair was designed and built by Goodyear Aircraft in the closing days of the war along the same general lines as the famous Vought-Sikorsky design. It embodies the 3500-horsepower Wasp Major 4360, a 28-cylinder, four-row, radial engine such as is used in the B-36 bomber. No previous single-engine plane ever carried as much power.

The F-2-G was never put into mass production, so only a few were made. Of these only three are in civilian hands. Cook Cleland owns two of them, both specially prepared for racing. The other is the property of Ron Puckett of Washington, D. C. This particular ship does not have the refinements of Cleland's planes, but it is still a promising contender for Thompson honors. Although the Cleland planes experienced engine trouble due to an experimental fuel last year, they are still the world's best closed-course racers. They are particularly well suited to the tight pylon turns and low-altitude flying found in the Thompson Trophy Race.

Another surprising performer is the much-maligned Airacobra. Although the P-39 became obsolete as a fighter some years back, it had enough oomph to win the first postwar Thompson. Furthermore, it was the fastest qualifying plane last year. Using alcohol-triptane fuel, young Chuck Brown of Indianapolis burned up the course at 418.300 miles per hour. He also led the big race for 18 laps with a new record almost in his grasp before engine trouble forced him down.

Originally, two of these ships were prepared for the races by Bell test pilots Jack Woolams and Alvin Johnston. Christened Cobra I and Cobra II, the planes were identical, having Allison 1500-horsepower engines substituted for the original 1000-horsepower type. Both showed terrific speed, but unfortunately the Cobra I crashed in Lake Ontario with Woolams at the controls during prerace tests in 1946.

(Continued to page 254)

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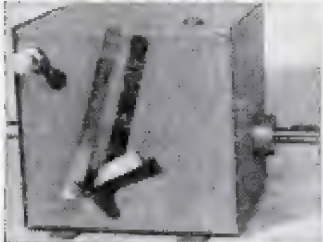
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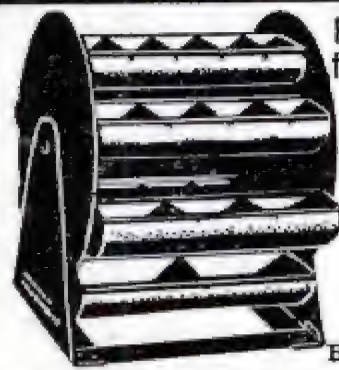
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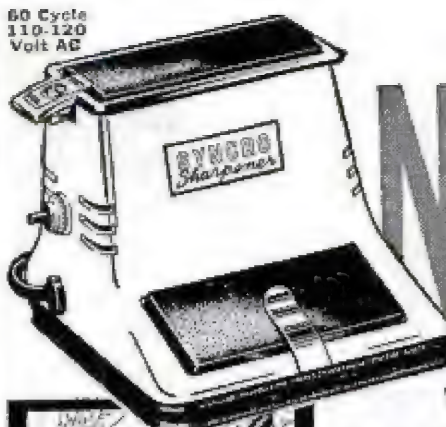
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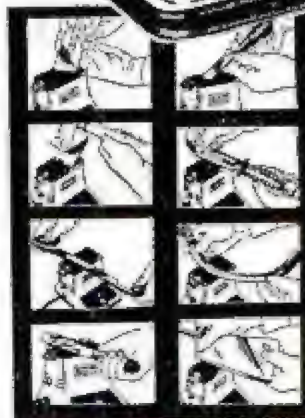


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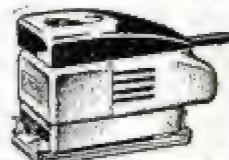
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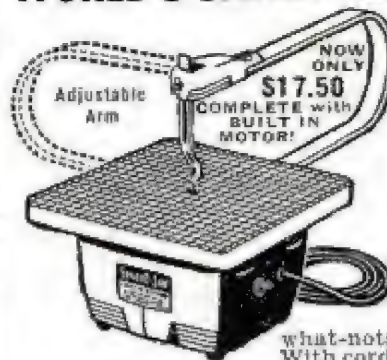
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Tex Johnson, however, went on to win the Thompson Trophy in the Cobra II. Jay Deming, another Bell test pilot, flew the Cobra II to a third place behind Cleland's two Corsairs in 1947. Chuck Brown flew this same airplane with a new propeller, a further souped-up engine and rechristened KF-1. His amazing performance puts this P-39 in the same class as the F-2-Gs for future races.

Another airplane that has appeared in great abundance on the racing fields is the Bell Kingcobra. To that rugged ship goes the ignominious honor of nailing down last place in all three of the postwar Thompson races. Probably no other plane has undergone as much surgical work at the hands of hopeful contestants as has the P-63. Charlie Tucker, an ex-Flying Tiger, started it all when he trimmed his Kingcobra down to a 25-foot span. Other pilots followed suit, but still these ships have made a poor showing in competition with the previous mentioned types. The best racing record among the P-63s is held by the Spirit of Tick, flown last year by Bob Tucker and owned by Russ Hosler of Cleveland. Hosler has recently acquired Tucker's plane also. This ship is a real "hot rod," having shown greater speeds than any other of its class. Both of these Kingcobras are of Thompson caliber.

Another well-known plane to be seen at the air races is the AT-6. Having served as an advanced trainer, this airplane would seemingly be a far cry from the racing type. But it fits admirably into the special contest that has been created for it. The only pylon race which has been open to women pilots since the war has required that the North American AT-6 be used.

The ladies have not been outdone by their flying brethren in adapting their lowly trainers to the sport. Typical of that class is the ship flown last year by Mrs. Grace Harris of Kansas City. A streamlined fairing completely covers the rear cockpit. The three-blade propeller with reduction drive also is an innovation over the standard model. Mrs. Harris won the Kendall Trophy at an average speed of 239.962 miles per hour in her AT.

These fighter planes are the only contenders in the unlimited horsepower class of racing at the present time. Experimental and foreign types may appear at the forthcoming races, but they will be hard put to better the performance of these ships. The best of the fighter craft developed during World War II, they have become the fastest racers the world has ever seen. Today the Corsairs, Mustangs, Lightnings and Cobras are the cream of powerhouse planes.

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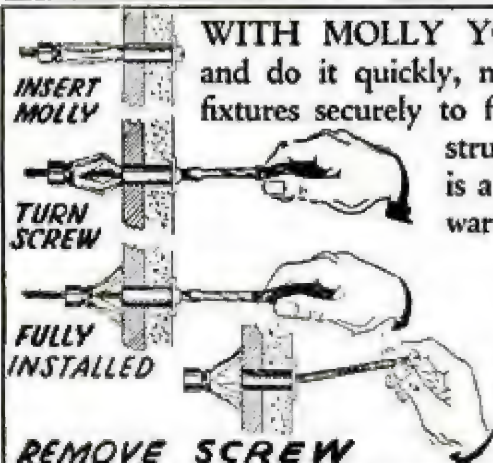
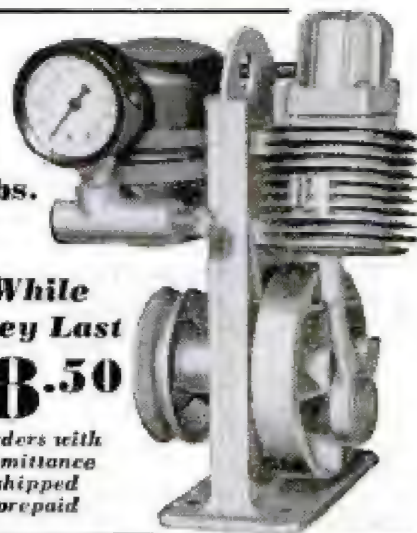
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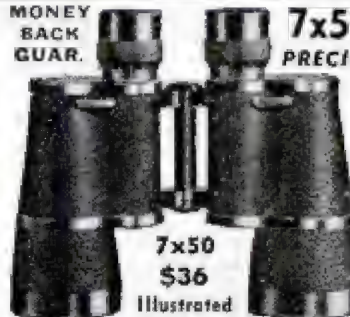
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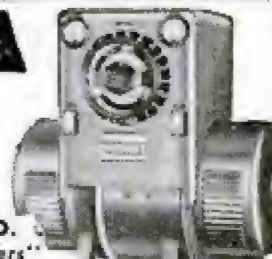
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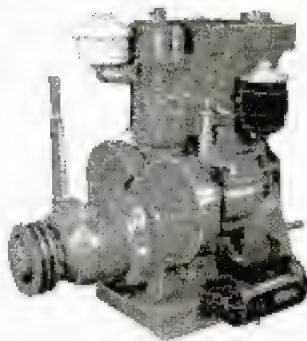


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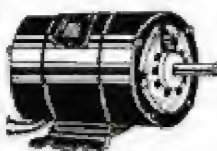
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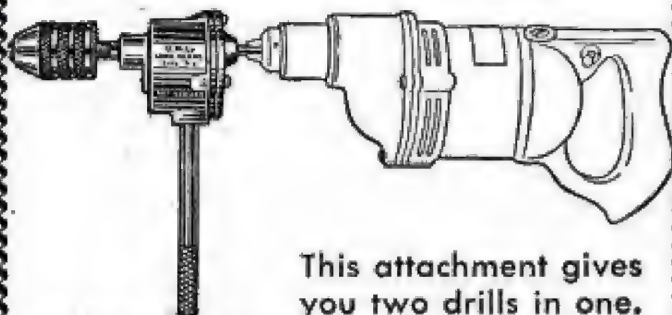
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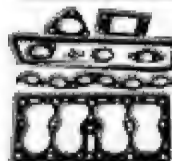
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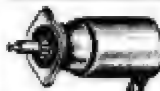
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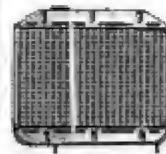
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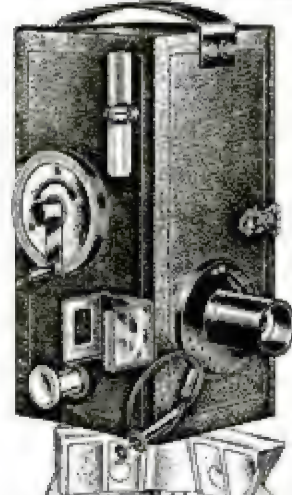
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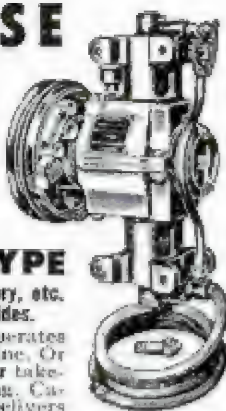
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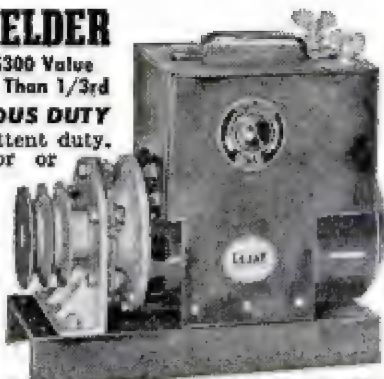
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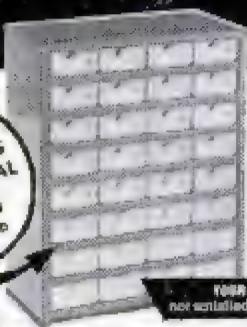
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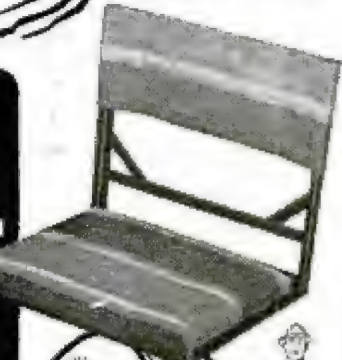
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Seat grip attachment for fastening to boat seat, etc. *Optional



**IT'S PORTABLE
FOLDS FLAT**

Relax in comfort with this convenient,
portable seat. Constructed for hard usage
and long wear. Back and felt-filled
cushion covered with sturdy, bright canvas
duck. Steel frame, finished
in Walnut baked-on enamel.
See Your Dealer or Send Check
or Money Order.

\$3.95
POSTPAID

*Add 30¢ to above price for SEAT GRIP

McENTIRE BROTHERS, INC.
239 QUINCY ST. TOPEKA, KANS.

HIGH POWER TELESCOPE

60 POWER - ALUMINUM TUBES - OPENS TO 33"
Variable Power Eyepiece Adjustable
to 15X, 30X and 60X.

\$4.50 Leather Case Included

5 Sections. 4 Ground & Polished Lenses. Also used as
50X Microscope. Ready to use, only \$4.50 POSTPAID.
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NEW YORK 19, N. Y.**

ELECTRIC SIREN Fender Skirts for All Cars

ELECTRIC SIREN
6 volt. Complete
with push button...
\$10.95

Fender Skirts for All Cars
Give year, make
& model of car
when ordering.
All Metal. Prime-
finish. Rubber
beading prevents
rattle.
Easy to install.
PAIR...
\$12.95

DUAL MUFFLERS
Increases power. Reduces back
pressure. Saves gas.
Model-208—
Complete Set.....
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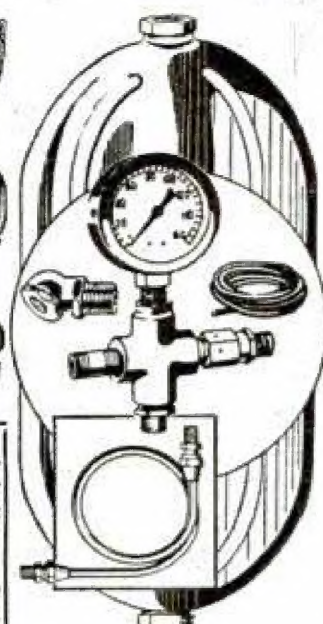
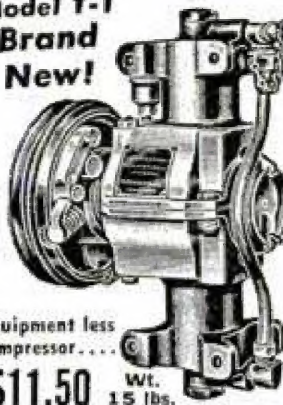
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FOR
ALL
CARS
Gives that Motorboat
Tone. Universal type
to fit all cars, ea....
\$4.95

We Can Supply **NEW CONVERTIBLE TOPS &
REBUILT MOTORS** for all Cars. Write for Prices.

Send 25% Cash With All Orders, Balance C.O.D.
J. C. WHITNEY & CO.
1917 ARCHER AVE. CHICAGO 16, ILL.

"Wellworth" Sensational Offer! Reg. \$60.50 WESTINGHOUSE AIR COMPRESSOR

Model T-1
Brand
New!



2-CYLINDER PISTON TYPE Operates with 1/2 H.P. motor or equivalent gas engine

Automatic clutch makes it suitable for mounting and operating from truck, tractor, etc. Instructions furnished. Replacement parts available. Wt. 26 lbs. Price of compressor only.....

Complete outfit consisting of compressor, pressure tank, air gauge, air chuck, 20-ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples—Complete Outfit only Wt. 40 lbs.

IDEAL for HOME • FARM • FACTORY

Wherever Compressed Air is Needed

A fortunate purchase from the Government enables us to offer you this amazing buy. This low price is but a fraction of the price of manufacturer and of leading mail order houses. All Brand New equipment. ORDER NOW!

\$21.50

\$31.25

Equipment less
compressor....

\$11.50

Wt.
15 lbs.

THE COMPRESSOR

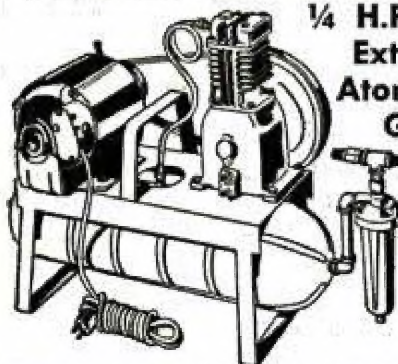
Piston Type, 2-cylinder, 2 inch bore, 1 1/4" stroke Ball Bearing AUTOMATIC CLUTCH, OIL FREE AIR. 3.27 C.F.M. at 600 R.P.M. Capacity up to 6.54. Suggested operating pressure 75 P.S.I. DIMENSIONS: 9" wide, 11 1/8" high, 6 3/4" deep. Wt. 26 lbs.

TANK AND ACCESSORIES

6" x 24" stainless steel tank. Suitable for 150 lb. pressure. Two 1/4" openings. Air gauge, pop valve, air chuck, 20 ft. hose, copper tubing and fittings as described.

PORTABLE SPRAY OUTFIT

1/4 H.P. Heavy Duty
External
Atomizing
Gun



None Better
at Double
This Price

Paint Sprayer mounted on 8 x 24 inch tank, 1/4 H.P. 110 V. 60 cy. Heavy duty motor with overload relay, 10 ft. cord and plug, V Belt drive. Piston type Compressor with 2 Compression rings, 1 oil ring, 2 inch Bore, 1 1/4 inch stroke, displacement 2.86 C.F.M. at 60 lbs. pressure. Safety Valve. Gun external atomizing. Flat and round spray, quart cup; maintains 35 to 40 lbs. working pressure. Oil and water extractor, 1 air gauge, 20 ft. heavy duty 2-braid air hose with leak proof fittings, complete with carrying handle. Net weight 54 lbs., ship. wt. 60 lbs.

\$57.50

Outfit less motor.....\$47.50
Compressor only.....17.50
Spray gun and 20 ft. hose 12.95

140 CFM "WELLWORTH" BLOWER



Single-inlet blower that gives top performance on heating, ventilating, exhausting, cooling, drying and similar applications. 5 1/4 x 4" mounting flange with 2 1/2" square discharge. 3 1/2" dia. blower wheel powered by direct-connected 1/15 H.P., 110V., 60C., A.C. motor with conduit box and 20" leads. 7 1/2" wide less flange by 7 1/4" H. x 6 3/4" D. Suited for hundreds of new and replacement uses. Shpg. wt. 6 lbs.

\$16.50

PNEUMATIC AIR TOOLS

USED, GUARANTEED LIKE NEW.



CHICAGO PNEUMATIC RIVETER & CHIPPING HAMMER

CP4X Pistol grip handle. Takes up to 3/16" rivet. Weight 6 lbs. List price \$73.00.

SPECIAL PRICE.....\$14.50
Same as above, brand new.....\$22.50
Size CP3. Takes 5/32" Rivet.....\$10.95

Chicago Pneumatic Lever Type AIR DRILL



With 1/4" Jacob Chuck. Wt. 2 lbs. List price \$17.50 \$55.00. Only.....



Ingersoll Rand AIR DRILL

With 1/4" Jacob Chuck. Wt. 2 lbs. List price \$17.50 \$55.00. Only.....

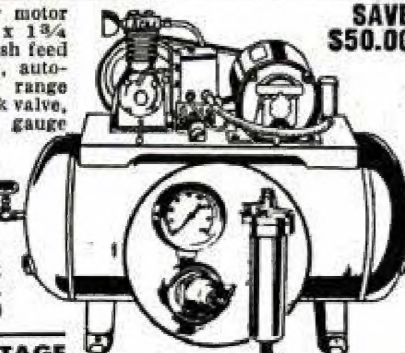
AUTOMATIC COMPRESSOR UNIT

SAVE
\$50.00

1/3 H.P. heavy duty capacitor motor AC 110/220 volt 60 cycle, 2 x 1 1/4 inch piston type compressor, splash feed lubrication, 12 x 24 inch tank, automatic pressure switch, pressure range 100 to 125 lbs., CFM 2.2, check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Shipping wt. 90 lbs.

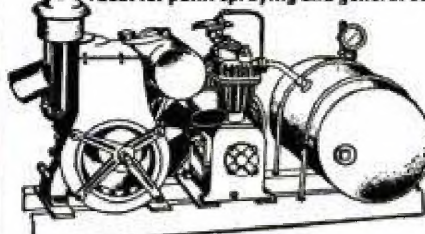
Special \$79.50
Price

Same unit as above with 1/2 H.P. motor, furnished with 13" x 24" tank. CFM 2.8 at 125 lb. pressure. Shipping wt. \$98.50



"WELLWORTH" TWO STAGE COMPRESSOR UNIT

Ideal for paint spraying and general use



Compressor with unloader, wt. 160 lbs. \$128.00
Engine only, wt. 90 lbs. 87.50
Tank and accessories, wt. 110 lbs. 62.50

Compressor: Size 3 1/2 x 2 x 2 1/2 with unloader for continuous pressure service; displacement 10 C.F.M. at 200 lbs. pressure. Unloader set at 150 to 185 lbs. Compressor idles when 165 lbs. is reached, starts pumping again when pressure is down to 150 lbs. Wisconsin Gasoline air cooled, easy starting engine. 3 1/2 H.P. at 1800 R.P.M. 4.1 H.P. at 2400.

Air Tank: A.S.M.E. 200 lbs. working pressure; size 18" x 20" with safety valve, drain, two 3/4" globe valves and pressure gauge. 2 "V" belts and pulley. 40 ft. air hose and fittings.

Reg. \$225 less mounting base \$400 Shipping wt. 350 lbs.



AUTOMATIC PRESSURE SWITCH WITH UNLOADER

Double pole, with 2 way release valve. Set at 125 to 150 lbs. pressure. \$10.25 Wt. 4 lbs. Only.....

"Wellworth" Check Valves



Dash pot type
Quiet operating
1/4" valve \$2.75
1/2" valve \$4.50



"Wellworth" 1/4" REDUCING VALVE & GAUGE

Oil resistant, pressure 0 to 200 lb. Reduced pressure 0 to 75 lb.; 3 outlets 1/4". \$5.75 Wt. 2 lbs.



6 FT. STOW FLEXIBLE SHAFT

Heavy Duty, 3/8" Core. Best piano wire. Ball bearing handle and arbor. Rubber covered housing; for 1/2" motor shaft; for 1/4" bore wheels. Operates on 1/4 H.P. Motor at 1725 or 3450 R.P.M. \$29.00 Value, \$14.50. Wt. 8 lbs.

Prices f.o.b. Chicago. Immediate delivery. All items sold on money back guarantee. Send check or money order today.

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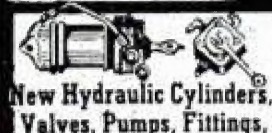
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Merged with C & M Equipment Co.

1831 S. STATE ST. DEPT. D-8 CHICAGO 16, ILL.

SAVE UP TO 85% in WAR SURPLUS & BANKRUPT STOCKS at 'GADGETEER'S HEAVEN'

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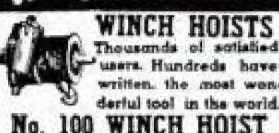


New Hydraulic Cylinders, Valves, Pumps, Fittings.

Hose and Tanks
51 SIZES AND TYPES.
WORLD'S LARGEST SUPPLY
1001 Labor Saving Adaptations
for Pulling, Pushing, Lifting
Operations. Final Precision
workmanship and materials.
Liquid and/or Air Operation.
developing terrific power. 20,000
Available. Write for Catalogue
Priced to sell at 15% Gvt. Cost

New Electric Motors

#500 new RHP-27 Volt
DC-24 Volt AC. This
motor can be readily ad-
apted to deliver up to 1/2
HP on 110 Volts AC by
the simple method of re-
arranging armature brush-
leads. We furnish free
diagram of instructions
with each order. A Sen-
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#500A Converted to 110 Volts-AC.
Equipped with plug and 3/8 in.
Heavy Duty Cord \$8.49
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Volt DC Motor. Series
wound. NEW - \$3.95 ea
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24 V DC used - \$8.95



WINCH HOISTS

Thousands of satisfied
users. Hundreds have
written. the most won-
derful tool in the world.
No. 100 WINCH HOIST
Cap. 2500 lbs. with 24:1 ratio con-
trolled bronze worm gear. 19" 1/4"
alloyed steel cable with hook. two
speed handle. Ideal for
Boat Garage, etc. \$100 Val \$15.99



DC GENERATORS

Suitable for
adaptation to
home welding
units, portable & rural lighting, power
plant on boats, etc.

TYPE	AMPS	VOLTS	
New G1	140	27	\$17.95
New T1	25	12	\$13.95
Used But Guaranteed Condition			
P1	300	27 1/2	\$22.50
R1	300	30	\$29.75
ESA	50	12	\$17.95

D.C. METERS

AMMETERS	0 - 120	0 - 30	\$3.95
#30 - 0 - 30 +	0 - 140		
#30 - 0 - 30 +	0 - 200		
#30 - 0 - 30 +	0 - 250		

All 2" face except 0 - 300 which is 3" face.

COMBINATION VOLT-AMMETER

30V - 30 AMP \$4.95

30V - 60 AMP

SHUNTS Required for use with D.C. Ammeters 30 -

60 - 120 - 240 - 300 - 350

SOLD ONLY WITH METERS \$1.00



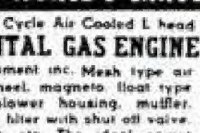
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Genuine Red Seal 4 Cycle Air Cooled L head
standard equipment inc. Mesh type air
cleaner, flywheel, magneto float type
carburetor, blower housing, muffler,
fuel tank, fuel filter with shut off valve,
starter pulley, etc. The ideal power
package for light tractors, lighting
plants, compressors, boats, lawn mow-
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A \$75.00 VALUE
NEW For ONLY \$47.95



New BRIGGS & STRATTON MODEL "A" GAS ENGINE

Rating 2.10 H.P. 4 cycle, single cylinder.
Complete in original Factory Crates.
A \$102 Value for Only \$64.95



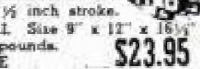
POWER UNIT

The Complete Model G33 12-
24-100 Cossack of a Single
Cylinder, Air-Cooled, Four-
Cycle Briggs-Stratton Gasoline
Engine, Type-Stroke Cylinder,
Air Cooled, L-Head, Four-
Cycle, 8 H.P. Bore 3",
Stroke 3 1/4". Governed for
Speed Between 2500 - 3200
R.P.M.
Directly Connected to a Direct Current
Generator at 2800 Watts. Rating 24.5
Volts. 100 Amps to form an integral Unit.
Fuel Container 1 1/2 Gallons.
The Engine and Generator are Mounted on Four Shock Ab-
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4 Wheeled for Mobility can be used as Lighting Plant or
Power Supply. A TERRIFIC VALUE!
RECONDITIONED GUARANTEED ONLY \$109.89



AIR COMPRESSOR

Thousands now in use for spraying,
inflating, tractors, trucks, garage,
laboratory, air tools, industrial use,
etc. Lightweight but powerful, can
be run by 1/4 H.P. Motor or Gas
Engine. Operates in either Direction
or rotation. Gives approximately 3.27 CFM
at 800 RPM. 6.34 CFM displacement at 1200
RPM. Has 2 inch bore, 1 1/2 inch stroke.
Suggested pressure 75 P.S.I. Size 8" x 12" x 18 1/2"
Weight approximately 23 pounds.
AT THIS NEW LOW PRICE \$23.95
Motors, Tanks, Fittings to Adapt this Unit also Avail.



MECHANIC'S MONKEY WRENCH

Adjustable 4" jaw opening. Black 79c
Drop forged Anvil, type. Plated 89c



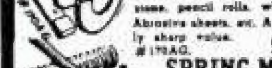
GADGET MIX

Especially prepared for the
HOBBYIST. Rivets, Spacers,
Balls, Screws, Nuts, Washers,
etc. A gold mine. \$1.19



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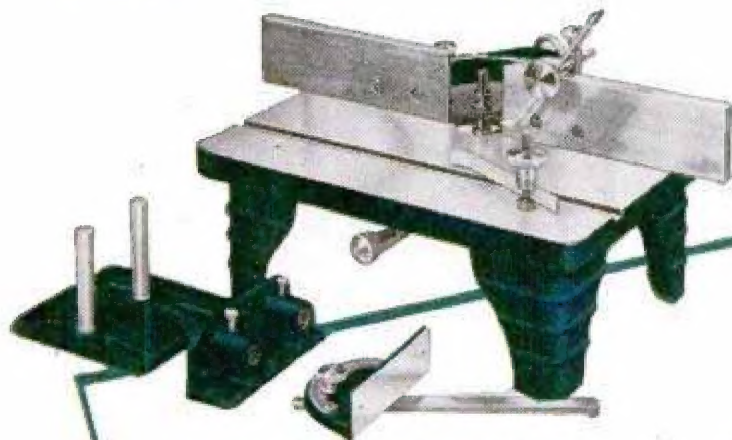
Needle, Ball & Roller Bear-
ings in excellent assortment.
Balls from 1/8" to 1". One
of our "BEST SELLERS".
15 BEARINGS \$2.95
#170 for ONLY \$2.95



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12 pairs of top and butt
Hinges. Sizes 1" x 1 1/2",
1 1/2" x 2", 2" x 2 1/2",
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4 1/2" x 5", 5" x 5 1/2",
5 1/2" x 6", 6" x 6 1/2",
6 1/2" x 7", 7" x 7 1/2",
7 1/2" x 8", 8" x 8 1/2",
8 1/2" x 9", 9" x 9 1/2",
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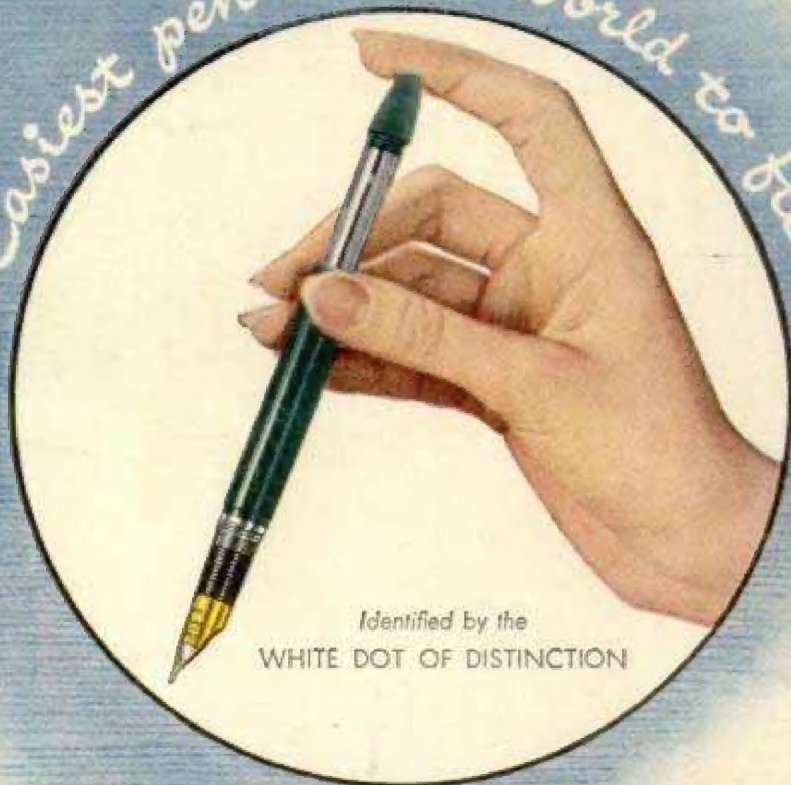
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